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ABSTRACT

The overall objective of this 4-phase study was to provide the Four Corners Regional Commission with an evaluation of industries best suited for the region. In order to satisfy this objective, 100 industries and products were identified which have the highest potential for development in the total region, as well as in specific subregions. The resources of the subregions and the requirements of these 100 industries were analyzed. The industries were ranked according to the number of subregions where they were among the top 40 feasible industries. It was found, for example, that production of metal office furniture ranked high in all subregions, while production of engine electrical equipment ranked among the top 40 industries in only 1 subregion. Using tables in the document, industries which are most feasible for the region as a whole can be ascertained, as can those industries which are best suited to each of the subregions. In addition to identifying the industries most suitable to the region, the document contains analyses of (1) the region's existing industrial and economic base, (2) barriers to industrial development, and (3) types of support required to attract new industries and strengthen existing ones. (LS)

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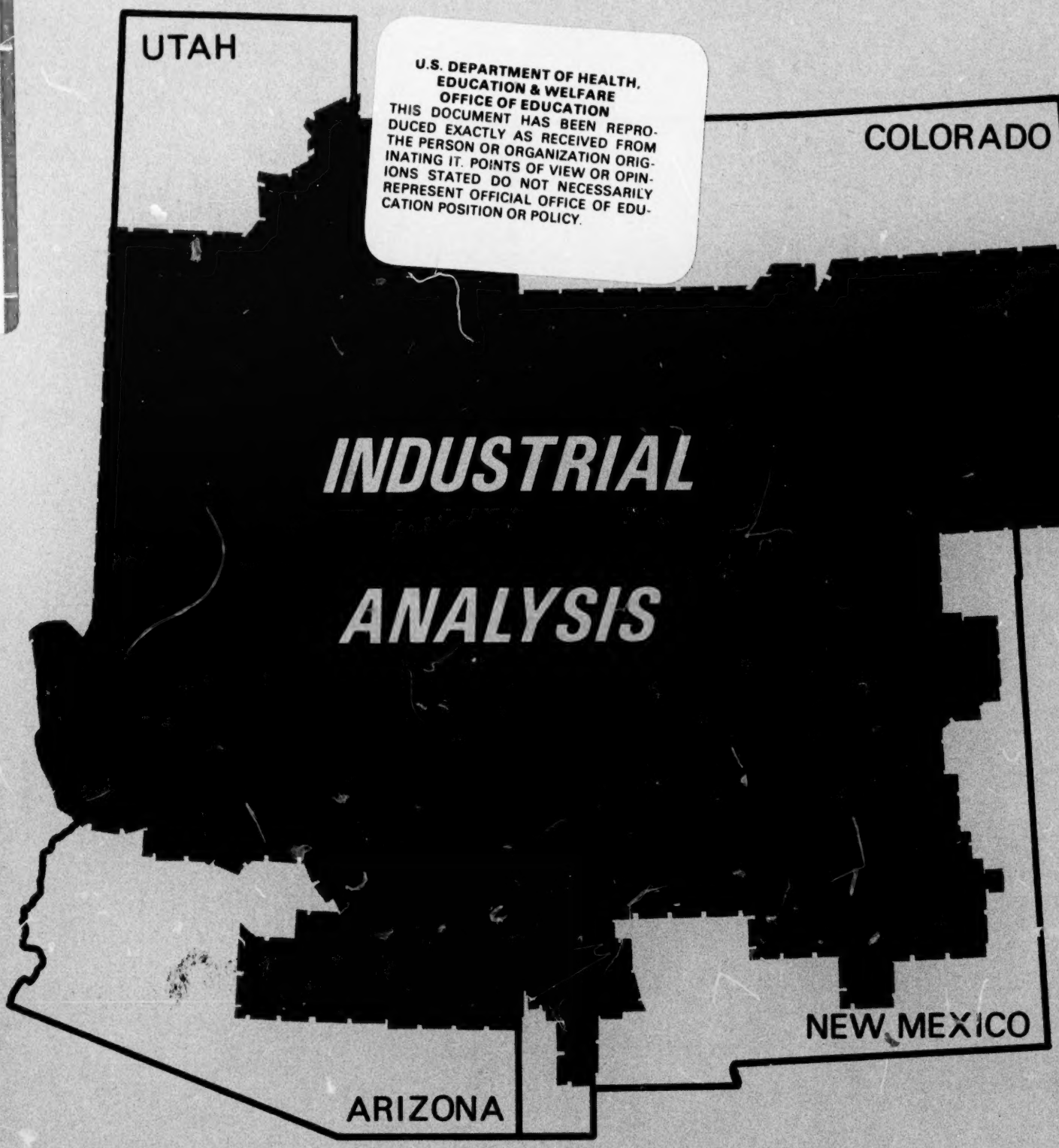
AN ANALYSIS OF THE ECONOMIC STRUCTURE AND INDUSTRIAL POTENTIAL OF THE FOUR CORNERS REGION



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prepared for
THE FOUR CORNERS REGIONAL COMMISSION
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SUMMARY REPORT

on

AN ANALYSIS OF THE ECONOMIC STRUCTURE AND INDUSTRIAL POTENTIAL OF THE FOUR CORNERS REGION

to

THE FOUR CORNERS REGIONAL COMMISSION
Farmington, New Mexico

May, 1971

by

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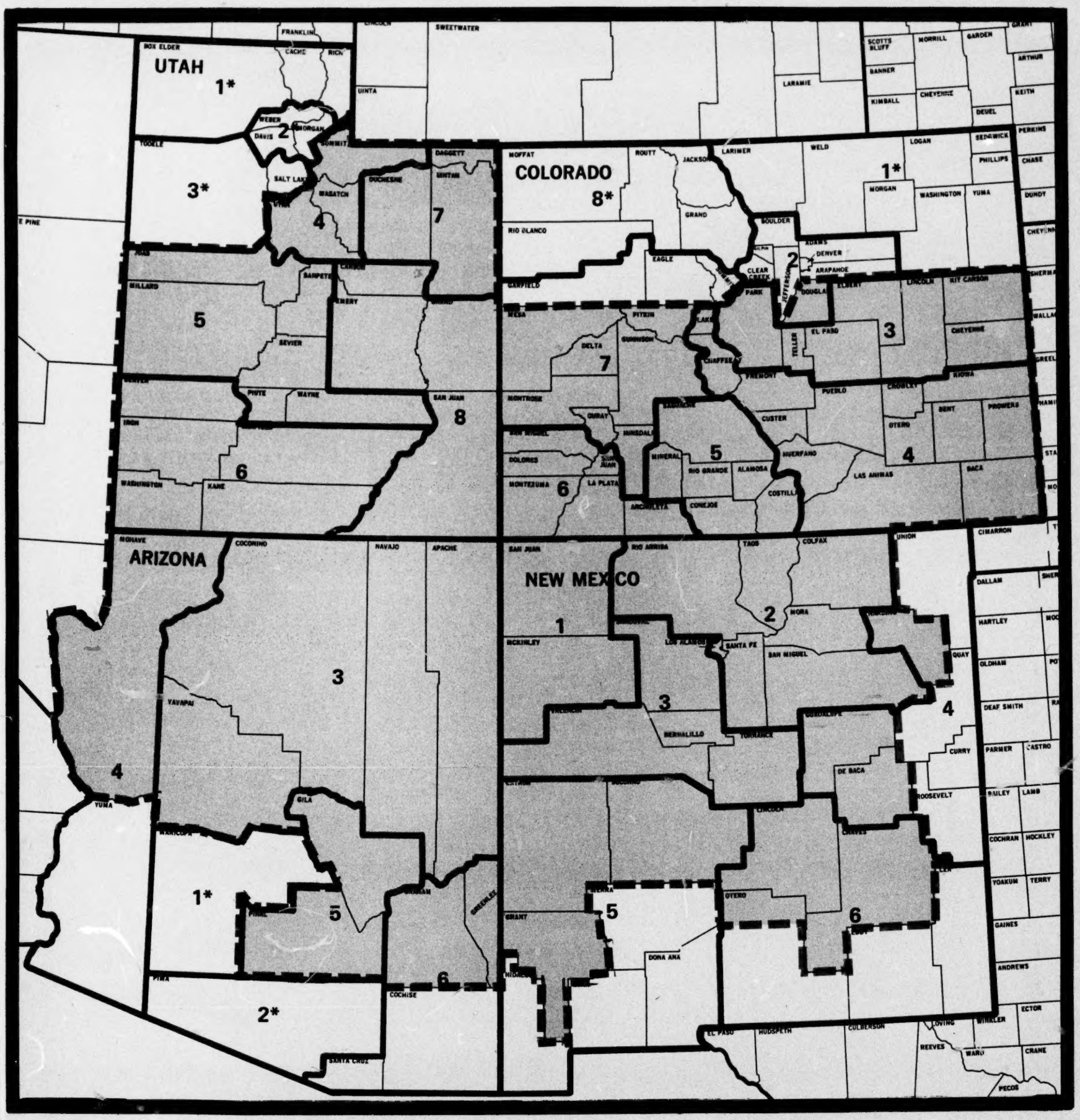


Gray Area shows the four-corners region.

FIGURE P-1. THE FOUR CORNERS REGION AND SUBREGIONS

*Indicates subregions which are completely outside four-corners region.

I

EXECUTIVE SUMMARY

INTRODUCTION TO "AN ANALYSIS OF THE ECONOMIC AND INDUSTRIAL POTENTIAL OF THE FOUR CORNERS REGION: PHASE II"

In many ways, the Four Corners Region of Arizona, New Mexico, Colorado, and Utah is one of the richest areas of the United States. It offers a scenic beauty, forest resources, minerals, uncrowded open spaces, and (for many) a very favorable climate that could not be matched anywhere else in the country. However, despite the presence of these natural advantages, the Region demonstrates a number of pervasive economic and social liabilities which have caused it to fall behind many other areas of the county and the non Regional portions of the four states in terms of both employment and income. As stated in the Commission's First Annual Report:*

> "Problems which led to creation of the region include high unemployment (5.7 percent in 1960 contrasted to a 5.1 national rate), low family income (25 percent of the families in 1960 had an income below the poverty level of $3,000 a year contrasted with 20.1 percent nationally), a higher percentage of inadequate housing, a lower percentage of the employable adults included in the labor force and a lower level of educational attainment."

In terms of developmental potential, a detailed analysis of the avenues and areas of possible manufacturing expansion is extremely relevant for two basic reasons. First, given the socioeconomic nature of the Region, expanding industrial employment is one of the most effective means of creating new, better, and more dependable jobs, in both the short and long run. Second, manufacturing is an important "export" activity which will cause a flow of capital to the Region, leading to an improved balance-of-payments situation, and a general upgrading of the economic environment. It is important to recognize that the economic development of a region is not the same as attempting to attract industrial activity. Instead, economic development implies not only the creation of new and better jobs, but also the development of community services and amenities, elevating of human resources, expansion of infrastructural resources, and a marked increase in demand for the output of other sectors, especially the services. The development of industrial employment opportunities in the Region, in the immediate future, will serve as major catalysts and building blocks in stimulating this overall community and economic growth. Because the need for more and better jobs in the Region is a very real problem at this time, the findings of this research are based upon the area's current economic setting as opposed to situations which "may" exist at some time in the future.

Geographically, the analysis focuses upon the resources and capabilities associated with the Region itself, as opposed to the SMSA's on its periphery, or other external counties. A map of the Region is shown in Figure P-1. The subregions used in the analysis are also outlined on this map.

Utilization and Objectives and the Study. This study has been designed to be used effectively by a number of different types of organizations in the Four Corners Region. By sponsoring an analysis of the industries best suited for the Region, the Commission has provided a tool with which industrial-development professionals on the local level may more precisely define their growth and solicitation programs. Rather than take a shotgun approach to industry contacts, the screening matrices included in this report will enable them to direct their efforts to the most appropriate industry prospects.

The overall objective of this four-phase study is to provide the Four Corners Regional Commission with an evaluation of industries best suited for the Region. In order to satisfy this objective, specific industries and products have been identified which have the highest potential for development in the total Region, as well as in specific subregions.

The specific research objectives guiding this project are:

(1) To analyze the Region's existing industrial and economic base, with emphasis on the manufacturing sector

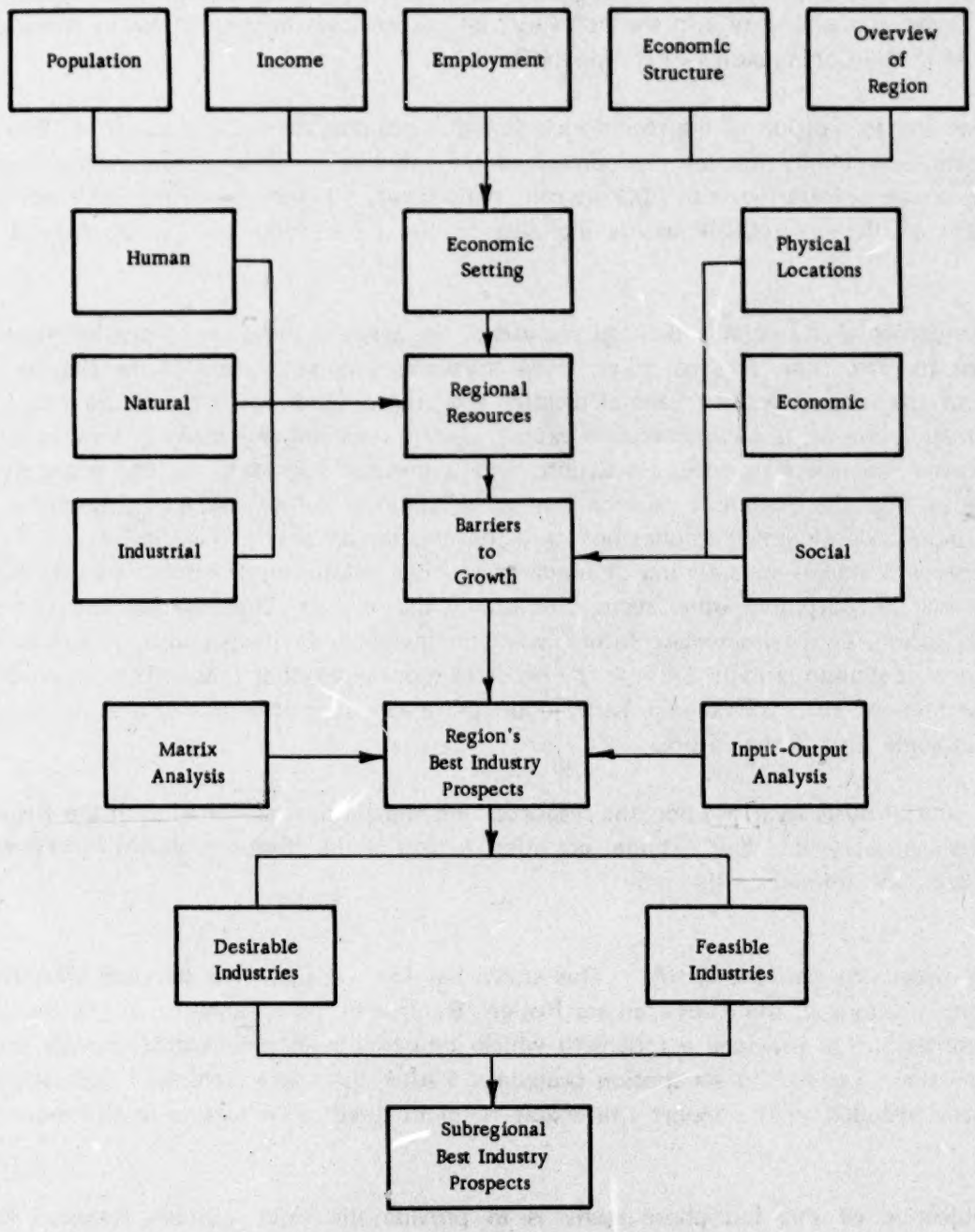
(2) To assess the Region's resources and to identify barriers to development which may be alleviated through efforts of the Commission

**First Annual Report* (Fiscal Year 1968), The Four Corners Regional Commission.

(3) To identify the industries which are best suited for the total Region and its component subregions

(4) To determine the types of support required in the Region to attract new industries and to strengthen existing industries.

The Four Corners Model. The elements in this study have been designed to be functionally related, in order to clarify the nature of the Region's resources and show how these contribute to the attraction or expansion of manufacturing activities. In order to satisfy the study's research objectives, and relate the major tasks comprising this effort, a descriptive model of economic development has been designed for the Four Corners study.



THE FOUR CORNERS MODEL

Developmental Goals of Local Leaders in the Region

In order to make this study most responsive to the needs of the Region, the Battelle research team surveyed a number of community leaders to determine what they considered to be the most important goals, barriers, and advantages for economic development in the Four Corners Region.

As Table 1 suggests, five major industrial-development objectives are by far the most important to these community leaders. The most important overall was the desire to attract new types of industries which would diversify the economic base. These leaders felt that many of the Region's industries at this time were seasonal and too low skilled and too low paying to ever allow the area to make significant progress toward raising standards of living. The second most important goal, to utilize existing labor more fully, is a direct reflection of the first and reflects the fact that many of the industries in the area, where they do exist, result in underemployment, if not outright unemployment. The other most important goals, as shown in Table 1, were to develop greater employment stability, reduce outmigration of skilled workers and youths, and to increase total payrolls. All of these goals could be met by developing industries which provide more jobs, more demanding jobs, and especially better paying jobs.

TABLE 1. ANSWERS TO THE QUESTION, "RANK, FROM 1 TO 5 ONLY, THE OBJECTIVES WHICH YOU BELIEVE TO BE MOST IMPORTANT IN THE INDUSTRIAL DEVELOPMENT OF THE FOUR CORNERS REGION"*

(Answers, ranked in descending order, according to number of times mentioned.)

1. Attract new types of activities to diversify the economic base
2. Utilize existing labor pool more fully
3. Reduce outmigration of skilled workers and youths
4. Develop greater employment stability
5. Increase total payrolls

*A "1" indicated the most important objective, while a "5" was less important.

The second question asked of these leaders was, "based upon your experience in business, industry, and community development, indicate what you consider to be the most important disadvantages for barriers of the Four Corners Region". The results of this survey question are shown in Table 2, and it is clear that a much larger number of barriers were identified than goals. It is important to note that an examination of this list of barriers indicates that many of them are interrelated and reflect a lack of intermediate and large size cities in the Region and its general isolation. For example, among the most important barriers indicated were lack of supporting services for industry, lack of a centralized financial market, lack of major metropolitan areas and consumer services, and poor surface transportation facilities. Almost every one of these are closely related to major cities and metropolitan complexes. Consequently, these statements reflect a very important characteristic of the Region, i.e., it is not only extremely sparsely populated, but it tends to be sadly deficient in terms of viable urban places.

TABLE 2. ANSWERS TO THE QUESTION, "RANK, FROM 1 TO 5 ONLY, THE FOLLOWING COMPARATIVE DISADVANTAGES OR BARRIERS THAT THE FOUR CORNERS REGION FACES IN ATTEMPTING TO ATTRACT INDUSTRIES"

(Answers, ranked in descending order, according to number of times mentioned.)

1. Lack of supporting services for industry
2. Poor national image of the Region, which stresses aridity and barrenness
3. Lack of a centralized financial market to facilitate industrial financing
4. A poor location in relation to other major markets and economic centers
5. Poor surface transportation facilities
6. Lack of a large, localized market
7. Lack of major metropolitan areas and related consumer services
8. Lack of quality housing

Table 3 indicates what the community leaders consider the Region's comparative advantages to be. The most important of these terms of attracting and strengthening industry were the trainability of labor force and favorable labor-wage rates. In most cases, these would be conducive to the development of labor-intensive types of industries. Factors such as climate and topography and the lack of urban congestion fall into the category of amenities and are much harder to attach some significance to. Others, such as labor availability, location near large West Coast markets, and an abundance of industrial sites should be considered important advantages.

TABLE 3. ANSWERS TO THE QUESTION, "RANK, FROM 1 TO 5 ONLY, THE FOLLOWING COMPARATIVE ADVANTAGES THAT YOU FEEL GIVE THE FOUR CORNERS A COMPETITIVE ADVANTAGE OVER OTHER AREAS IN TERMS OF INDUSTRIAL DEVELOPMENT PROGRAMS"

(Answers, ranked in descending order, according to number of times mentioned.)

1. Trainability of labor force
2. Favorable labor wage rates
3. Climate and topography
4. Lack of urban congestion
5. Labor availability
6. Natural resources
7. Location near the large West Coast markets
8. Many excellent industrial sites
9. Good labor-management relations

Utilization of the Community Leaders' Questionnaire

The opinions and insights provided by these leaders have been integrated into the analysis, by allowing these feelings to influence the selection of desirable industries. The first major industry screening to reduce the 413 possible industry groups to 145 for further analysis was carried out with full recognition of the objectives noted by these leaders.

The information collected through the use of questionnaires and personal interviews indicated that the most important development goals for the Region are:

(1) Attract new industry

(2) Utilize existing labor more fully, by creating new and better jobs

(3) Reduce outmigration

(4) Create greater employment stability

(5) Increase total payroll

(6) Attract higher wage industries

(7) Utilize Indian and Mexican-Americans more fully

(8) Attract new population

(9) Develop industrial linkages

(10) Reach small towns.

In the Desirability Matrix these considerations have been expressed as a set of criteria related to industries. Accordingly, the industries selected for detailed feasibility analysis

(1) Demonstrate above-average growth

(2) Are primarily labor intensive

(3) Have average to above-average wage scales

(4) Employ a number of blue-collar workers

(5) Are consistent in size with the labor supplies associated with particular centers

(6) Are not found exclusively in major metropolitan areas

(7) Demonstrate definite supply or industrial linkages to the Region.

CHAPTER 1. THE ECONOMIC SETTING

Any study of industrial development potential must begin with an understanding of the economy of the region involved. In this discussion, we are primarily concerned with an analysis of population, employment, occupation, and income characteristics. In addition, a brief overview of how the Four Corners Region differs from the entire four-state (Arizona, Colorado, New Mexico, and Utah) area is included. In order to describe the economy of the study area as accurately as possible and to indicate potential import substitutions, an employment-based input-output analysis was also carried out for the four individual states as well as for the combined four-state area.

POPULATION CHARACTERISTICS

By 1970, the Four Corners Region had a population of nearly 2 million people out of a four-state total of about 6 million persons; at the same time, the Region accounts for two-thirds of the land area of these states. Between 1950 and 1960, the Region's population growth rate exceeded that of the nation as a whole. However, between 1960 and 1970, it did not maintain the national growth rate. When compared with the non-Regional portions of the four study states, the Region's population growth has generally not been so rapid. Only in the Regional portion of New Mexico has the average annual growth rate been higher than that for the non-Regional portion of a state (see Table 4), and this is primarily because Albuquerque is found in this area.

TABLE 4. POPULATION CHANGES OF THE STATES AND REGION

	Population			Average Annual Growth Rate, percent	
	1950	1960	1970	1950-60	1960-70
United States	151,325,798	179,323,175	200,263,721	1.7	1.1
Four Corners Region	1,414,927	1,795,669	1,928,963	2.4	0.7
Arizona (State)	749,587	1,302,161	1,770,900	5.7	3.1
Colorado (State)	1,325,089	1,753,947	2,207,259	2.8	2.3
New Mexico (State)	681,187	951,023	1,014,979	3.4	0.7
Utah (State)	688,862	890,627	1,059,273	2.6	1.7
Four Corners Segment					
Arizona	207,763	260,909	315,008	2.3	1.9
Colorado	491,345	587,493	684,994	1.8	1.5
New Mexico	488,136	498,418	759,080	3.6	0.8
Utah	227,683	248,849	277,757	0.9	1.1
Non-Four Corners Segment					
Arizona	541,824	1,041,252	1,455,892	6.8	3.4
Colorado	833,744	1,166,454	1,522,265	3.4	2.7
New Mexico	193,051	252,605	255,899	2.7	0.1
Utah	461,179	641,778	781,516	3.4	2.0

Source: Population figures for 1950 and 1960 were taken from the *Phase I: Data Summary* which was part of the Phase I research. Populations for 1970 have been taken from *1970 Census of Population – Advance Reports.*

The areas of greatest growth in the four states are clearly the major metropolitan areas, most of which are outside the Region. They exhibit growth rates which tend to be much higher than those of either the Region or the four states. It is clear that any economic-development program carried out in the Region must take into account the competitive power of these centers; in the short run, the most successful Regional development program may be one designed to complement and serve these metropolitan areas in some way.

The population distribution and density of the Four Corners Region are very important to this study, as these two factors explain or are related to almost all of the barriers to economic development associated with the Region (see Figure 1). Forty-two percent of the people in the Region live in one of four Standard Metropolitan Statistical Areas (SMSA's) – Albuquerque, Colorado Springs, Provo-Orem, or Pueblo. Considering this fact, the actual population density over the remaining land in the Region is barely four people per square mile.

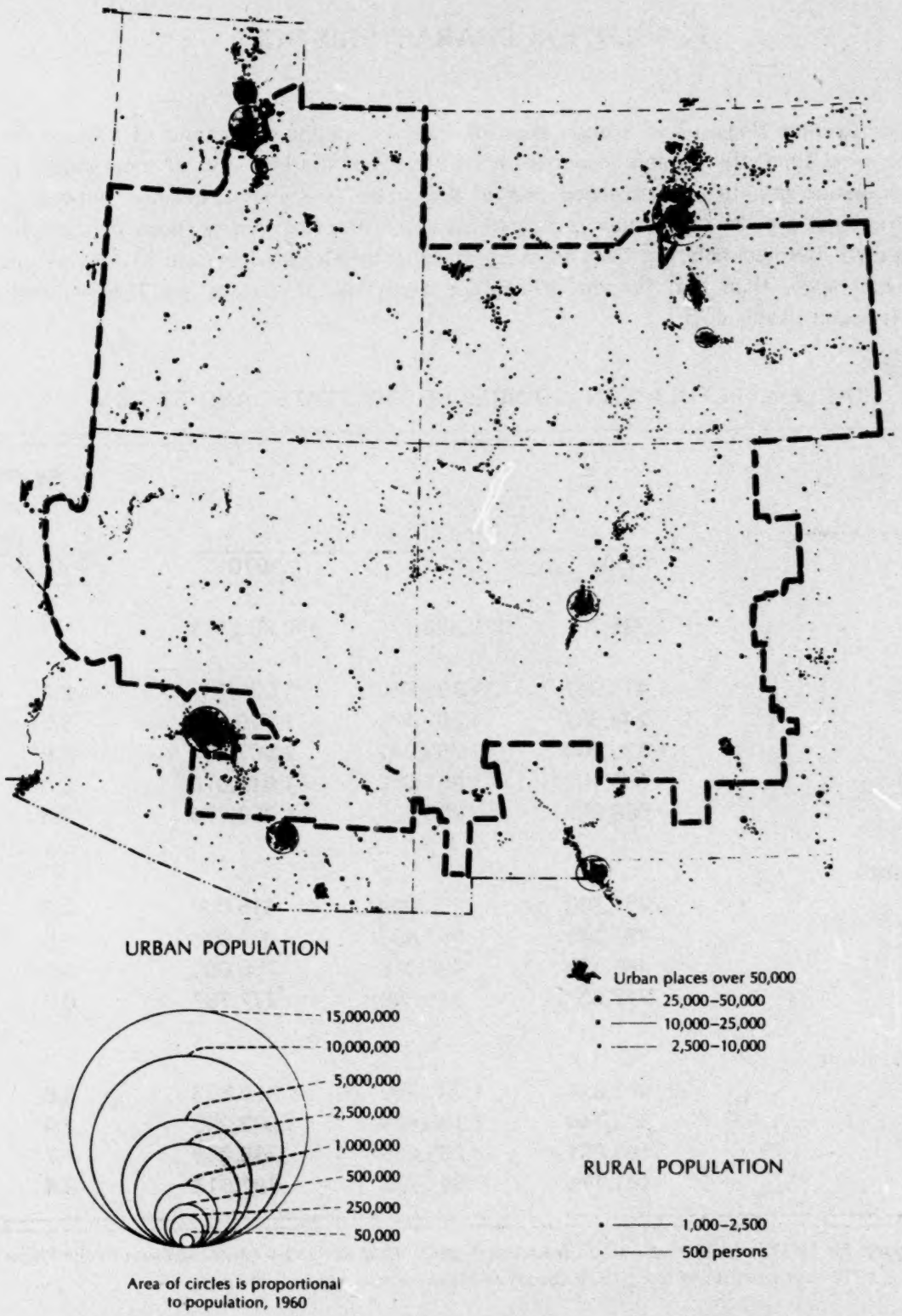


FIGURE 1. POPULATION DISTRIBUTION IN THE FOUR STUDY STATES (1960)

Source: *National Atlas,* U.S. Department of the Interior, Geological Survey.

This means that customers, suppliers, and workers are often found at a few specific locations in the Region, and some parts of the study area are markedly more attractive for industry than are others. More importantly, because important business-supporting services and many amenities are sensitive to customer (demand) thresholds, sparsely populated areas of the Region are in many cases deficient in transport, supply and repair services, financial support, trade and personal services, and other factors which determine the desirability of a location.

EMPLOYMENT CHARACTERISTICS

While no single index of economic structure is perfect, the best is probably employment. Unlike some other indicators, employment data are usually available in sufficient detail to describe an area's economy and are often relatively current. Further, changes in both the number and type of employment opportunities are perhaps the most important for individual families living in the Region.

Employment by Economic Sectors

Employment in major economic sectors for the Four Corners Region and the United States is shown in Figure 2 and Table 5. Figure 2 clearly indicates that the economic structure of the Region is different from that of the United States in general. The major difference between the national and Regional economic structures is the fact the latter has a much smaller proportion of its work force engaged in manufacturing. On the other hand, the Region has a greater percentage of

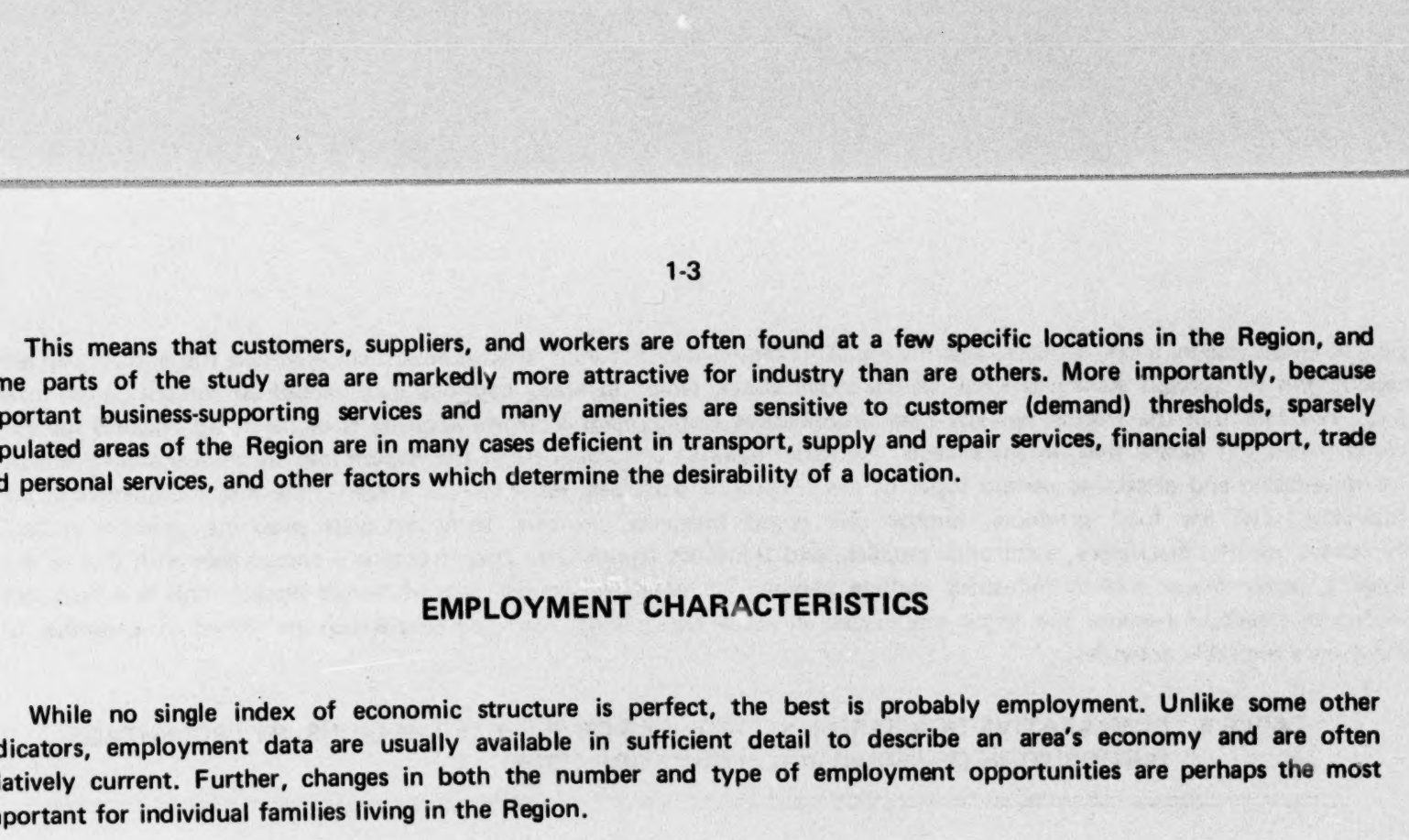


FIGURE 2. PERCENTAGE DISTRIBUTION OF EMPLOYMENT FOR U.S., FOUR CORNERS REGION, ARIZONA, COLORADO, NEW MEXICO, AND UTAH – 1968 ANNUAL AVERAGE

Source: *County Business Patterns, 1968,* U.S. Department of Commerce, Bureau of the Census.

Note: Government and self-employed persons are not included in the data coverage. Sectors with less than 1 percent of total are included in the "other" category.

people employed in trade, services, and mining. This figure does not include government employment (usually 25 percent federal and 75 percent state and local) in the study states, which in many counties may exceed 20 percent of the total jobs. The fact that the Region has less than proportional employment in manufacturing is of major significance for this study because it means that, in some cases, industrial markets and suppliers in the Region may be smaller than desirable for developing and attracting certain types of manufacturing activities. As shown in Table 2, the major industries in the four-state area are food products, lumber and wood products, printing, stone-clay-glass products, primary metals, fabricated metals, machinery, electronic supplies, and transport equipment. This structure is comparable with that of the Region, where major growth industries include apparel, electrical equipment, and fabricated metals. This is a favorable industrial structure because the larger employers all offer high-paying, high-skill jobs which are linked to a number of other very desirable activities.

TABLE 5. COMPARATIVE INDUSTRIAL STRUCTURES OF SELECTED REGIONS: BY PERCENTAGE DISTRIBUTION OF INDUSTRIAL STRUCTURE (1963)

SIC	Industry	Regions						
		U.S.	Mountain	Four States	Arizona	Colorado	New Mexico	Utah
20	Food products	9.7	18.7	17.0	11.6	19.8	23.5	15.8
21	Tobacco products	0.5	0.0	0.0	0.0	0.0	0.0	0.0
22	Textiles	5.1	0.2	(D)	(D)	(D)	(D)	0.6
23	Apparel	7.5	2.4	3.1	4.6	1.9	2.1	4.0
24	Lumber and wood products	3.3	10.0	3.9	5.3	2.5	13.9	1.7
25	Furniture products	2.2	1.1	1.4	1.5	1.1	1.9	1.5
26	Paper and allied products	3.5	1.2	(D)	(D)	1.2	(D)	.6
27	Printing and publishing	5.4	7.3	7.2	7.3	8.1	9.6	5.0
28	Chemicals & allied products	4.3	2.8	1.6	1.5	1.8	1.6	1.4
29	Petroleum	0.9	1.9	1.1	0.1	1.0	3.3	1.9
30	Rubber products	2.4	2.4	(D)	(D)	(D)	(D)	.9
31	Leather products	1.9	1.0	(D)	(D)	(D)	(D)	(D)
32	Stone, clay, & glass prod.	3.4	5.5	5.5	5.6	5.2	8.8	5.0
33	Primary metals	6.6	8.9	(D)	7.9	8.2	(D)	14.0
34	Fabricated metals	6.4	3.8	4.4	4.6	4.5	2.2	4.9
35	Machinery	8.6	5.5	6.7	10.2	5.5	4.1	5.9
36	Electrical machinery & equip.	8.9	5.3	6.7	16.1	3.7	2.5	3.1
37	Transportation equipment	9.4	12.8	(D)	10.2	(D)	0.8	23.8
38	Instruments	1.8	1.0	(D)	(D)	0.9	(D)	(D)
39	Miscellaneous	2.3	1.3	(D)	0.8	1.7	(D)	1.2
19	Ordnance	1.4	4.8	(D)	(D)	(D)	(D)	(D)

Source: *Census of Manufacturers,* 1963. D = Disclosure Rule

Employment by Occupation

An analysis of the available occupational skills is important in assessing the Region's economic setting and is necessary for assessing the Region's industrial development potential. Examining the existing occupational skills is also a way of ascertaining what types of supportive services are available. The 1960 distribution of occupational skills is shown in Table 6. Compared with the United States, the category which appears to be the one with the greatest deficiency in the Four Corners Region is the operatives. In the United States, 18.4 percent of the employed people are engaged in operatives occupations. The Four Corners Region has only 14.3 percent of its employed in this group. Moderate gaps exist in the clerical and sales groups. At the same time, surpluses appear in the categories of managers, craftsmen and foremen, services, professional, technical, laborers, and farm-oriented occupations.

TABLE 6. PERCENTAGE DISTRIBUTION OF OCCUPATION GROUP OF EMPLOYED FOR UNITED STATES AND FOUR CORNERS REGION, 1960

Occupation	United States	Four Corners Region
Professional and Technical	11.2	12.8
Managers	8.4	10.2
Clerical	14.4	12.0
Sales	7.2	6.1
Craftsmen and Foremen	13.5	13.9
Operatives	18.4	14.3
Private Household Workers	2.7	2.3
Services	8.4	10.1
Farmers and Farm Managers	3.9	5.1
Farm Laborers	2.2	3.5
Laborers (Excluding Farm)	4.8	5.9
Not Reported	4.9	3.8

Source: U.S. Department of Commerce, Bureau of Census, *Characteristics of the Population, 1960,* Table 84.

Changes in Structure

It is important to note that in terms of relative growth, both trade and service employment is increasing more rapidly than manufacturing, and it is doubtful if the latter activity will attain the size of these other sectors. However, this is not abnormal, as manufacturing jobs are declining in relative terms nationally owing to increased productivity related to automation and other factors. Tables 7 and 8 indicate how the industrial structure of the Four Corners Region states compare with other regions. As shown in Table 7, the Mountain Region, which includes the study states, is experiencing growth in all but three industries which is more favorable than traditional manufacturing areas to the east. However, as shown in Table 8, the "national share" of industrial employment in a given industry is small for the mountain region, and the four-study states.

INCOME CHARACTERISTICS

The employment characteristics described above indicate some of the causes of the income gap that exists between most of the Four Corners Region and the natioon as a whole. Apparently much of the Region's labor force is employed in relatively lower paying industries and occupations. It can be seen from Figure 3 that the disparity in income-level distribution is at the higher and lower levels. There seems to be no inadequacy in the percentage of households in the middle-income group ($3000 to $9999) when comparing the Four Corners Region with the United States.

Historically, the per-capita personal income in the Four Corners states has been below the United States' average. The per-capita gap in absolute dollars is shown in Table 9. This dollar gap has been widening since 1950, and the percent increase in the four states has stayed below that of the United States. It should be pointed out that these are state-wide figures; the actual Four Corners Region is undoubtedly in an even poorer position when compared with the United States.

TABLE 7. PERCENT CHANGE IN MANUFACTURING EMPLOYMENT BY SIC FOR MAJOR CENSUS REGIONS, 1958-1963

SIC	United States	New England	Middle Atlantic	E. North Central	W. North Central	South Atlantic	E. South Central	W. South Central	Mountain	Pacific	Arizona	Colorado	New Mexico	Utah	Four-State Total
	5.8	1.8	-0.9	5.2	5.2	12.7	13.8	8.8	24.1	12.8	40.6	20.9	11.5	42.3	29.6
20	-4.4	-11.1	-8.5	-9.3	-5.6	2.7	2.9	0.5	6.8	-1.1	16.6	6.6	2.5	-4.5	5.0
21	-8.4	-60.1	-28.7	–	–	-1.0	-1.4	-54.7	0	16.3	0	0	0	0	0
22	-4.4	-18.5	-13.3	–	–	2.1	-2.6	-15.8	69.3	17.5	–	–	–	42.7	–
23	8.3	-5.2	-1.6	-0.6	3.7	36.9	34.2	23.4	28.4	12.0	57.4	18.0	-37.4	29.3	28.6
24	-3.8	-7.3	-3.6	1.4	-8.1	-10.7	-9.5	-4.3	7.5	2.5	6.7	-9.7	17.7	26.2	5.6
25	6.3	18.5	-3.9	0.1	-0.4	17.3	37.7	7.9	20.5	14.2	25.3	-20.0	111.6	29.0	8.7
26	6.7	-3.7	0.3	5.6	11.3	14.3	17.0	8.8	55.0	17.0	–	36.3	–	–	–
27	5.6	12.5	-0.2	3.4	6.1	14.4	11.8	9.5	15.7	11.3	43.2	9.0	2.3	33.6	19.4
28	5.6	14.4	2.2	-1.3	8.5	15.0	6.5	7.3	-1.6	7.7	21.8	-13.8	-28.5	-25.2	-11.8
29	-14.3	-12.9	-17.6	-18.2	-9.7	6.4	4.0	-17.2	-9.7	-5.5	–	14.5	-23.8	-7.4	-2.0
30	19.3	5.7	16.9	14.6	53.1	56.9	42.7	46.5	–	–	–	–	–	–	–
31	-6.2	-10.0	-8.0	-9.2	-17.6	5.6	29.3	32.8	34.3	-0.6	–	–	–	–	–
32	3.9	-1.1	-2.8	-1.8	7.8	11.6	13.8	10.5	20.5	11.5	51.0	19.0	26.9	2.3	22.3
33	3.2	0.5	-5.3	9.1	6.9	2.8	10.5	16.9	-10.7	3.1	-1.0	–	–	-11.1	–
34	2.0	-4.5	-3.1	2.1	2.6	13.5	12.7	15.1	6.9	2.9	49.8	4.8	-32.1	-5.5	8.2
35	8.1	1.0	-2.5	7.4	21.9	30.7	31.0	17.2	33.7	20.5	112.9	10.6	12.8	39.5	44.3
36	32.5	32.7	21.7	10.4	37.0	80.9	39.3	182.8	181.3	101.4	286.6	82.8	–	182.0	201.7
37	2.5	13.4	-1.1	10.3	-4.3	13.2	5.7	-12.9	269.3	-16.8	–	–	–	800.0	–
38	6.7	16.6	-10.6	24.1	11.2	79.7	16.2	3.5	–	–	–	78.7	–	–	–
39	7.2	-1.9	3.2	3.9	15.2	–	43.4	–	8.9	36.1	–	1.0	–	–	–
19	25.6	-18.7	-76.8	-8.4	–	–	138.5	575.3	-12.9	138.0	–	–	–	–	–
Admin./Aus.	20.3	16.8	14.3	23.5	25.3	39.3	6.4	12.9	40.0	28.8	135.2	30.9	60.8	6.2	34.4

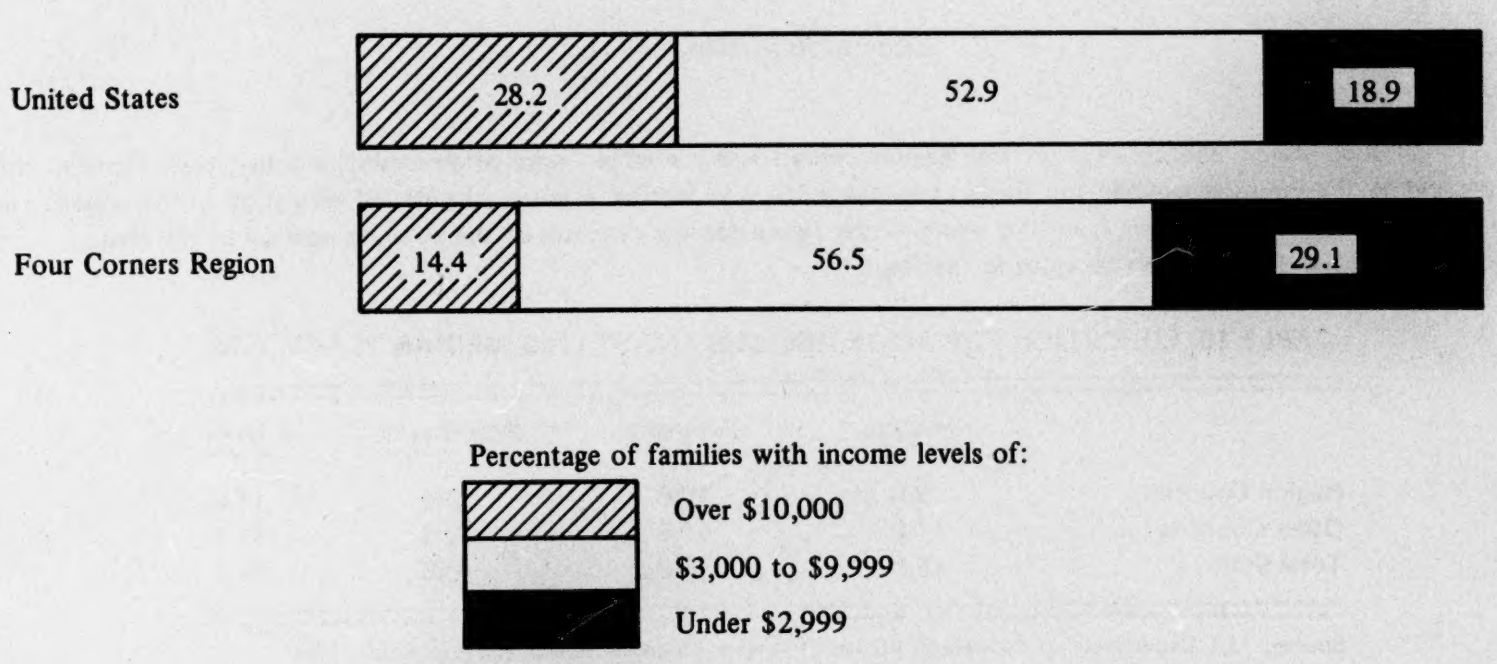
Source: *Census of Manufacturers*, 1963.

TABLE 8. PERCENTAGE DISTRIBUTION OF MANUFACTURING EMPLOYMENT BY SIC FOR FOUR CORNERS STATES AND MAJOR CENSUS REGIONS, 1963

SIC	New England	Middle Atlantic	E. North Central	W. North Central	South Atlantic	E. South Central	W. South Central	Mountain	Pacific	Arizona	Colorado	New Mexico	Utah	Four-State Total
Manufacturing*	8.4	24.0	26.4	6.0	12.5	5.3	5.1	1.7	10.6	.34	.55	.09	.32	1.29
20**	4.6	18.1	21.2	12.5	12.9	5.7	8.3	3.2	13.4	.40	1.13	.22	.22	2.27
21	0.4	14.3	3.0	–	65.8	15.3	0.5		0.1	–	–	–	–	–
22	11.7	17.1	3.0	0.6	56.5	8.8	1.1	0.1	1.1	–	–	–	.04	–
23	6.5	44.3	7.5	3.9	16.1	10.6	4.8	0.5	5.7	.21	.64	.02	.17	.54
24	4.9	5.8	10.4	3.5	19.5	11.7	9.8	5.0	29.4	.54	.42	.38	.17	1.51
25	5.7	17.2	23.6	3.5	24.7	9.0	5.6	0.9	10.0	.15	.28	.08	.21	.80
26	11.7	22.5	25.5	5.4	13.7	5.2	6.0	0.6	9.4	–	.20	–	.06	–
27	7.7	29.5	24.8	8.6	9.1	3.4	4.9	2.3	9.7	.45	.83	.16	.29	1.74
28	4.2	26.0	20.7	5.2	18.9	8.6	8.6	1.1	6.6	.12	.23	.03	.10	.48
29	1.3	16.7	18.8	5.4	3.3	1.8	35.3	3.6	13.8	.04	.60	.33	.65	1.63
30	15.6	19.2	37.9	4.5	6.8	4.5	2.7	1.6	7.3	–	–	–	.12	–
31	29.8	29.0	14.6	9.2	5.1	6.3	3.0	0.9	2.0	–	–	–	–	–
32	4.4	22.8	26.1	7.0	14.5	5.6	7.3	2.7	9.6	.55	.85	.24	.46	2.10
33	5.3	27.9	40.6	2.6	6.7	5.7	3.4	2.2	5.6	.40	.68	–	.67	–
34	8.5	23.0	37.2	5.3	6.5	4.5	4.8	1.0	9.3	.24	.39	.03	.24	.90
35	10.4	20.6	42.3	7.7	4.1	2.4	4.1	1.1	7.3	.40	.35	.04	.22	.99
36	10.7	27.8	30.3	4.7	6.5	3.2	2.9	1.0	13.0	.60	.23	.02	.11	.97
37	7.1	13.0	38.9	6.7	7.4	2.6	4.5	2.3	17.6	.36	–	.00	.79	–
38	16.4	38.3	23.6	5.3	4.3	1.1	2.3	0.9	7.7	–	.29	–	–	–
39	17.2	37.6	20.5	5.4	5.5	3.0	2.7	1.0	7.2	.12	.41	–	.17	–
19	6.2	3.5	8.0	8.0	5.7	2.9	5.1	5.5	71.3	–	–	–	–	–
Admin./Aux.	6.3	36.3	30.1	5.4	7.8	2.4	3.6	0.7	7.3	.09	.35	.02	.13	.59

*Manufacturing percentage refers to share of U.S. total.
**Industry percentage refers to share of state of regional total.

Source: *Census of Manufacturers*, 1963.



Source: Sales Management, 102 (12), B-4, D-4, D-6, D-24, D-25, D-121, D-179, D-180 (1969).

FIGURE 3. PERCENTAGE DISTRIBUTION OF FAMILY INCOME, 1968

TABLE 9. PER CAPITA PERSONAL INCOME FOR 1950 AND 1967

	1950	1967	Percent Increase 1950-67
United States	$1496	$3137	109.7
Four Corners States	1326	2712	104.5
Income Gap	$ 170	$ 425	

Source: *Statistical Abstract of the United States,* 1968, Department of Commerce.

DIFFERENCES BETWEEN THE FOUR CORNERS REGION AND THE ENTIRE FOUR-STATE AREA

Because the major metropolitan areas of Salt Lake City, Denver, Phoenix, and Tucson are located on the periphery of the Four Corners Region, and because there are no major topographical boundaries involved, it is often assumed that the patterns in the Region do not differ significantly from those observed in the overall four-state area. However, this is not true. There are important differences between the Region and the four states which are reflected by dissimilar developmental potentials. These differences appear to be most significant in areas such as population growth and distribution, as discussed above. They can also be seen in areas like educational attainment, the relative location of the Region compared with the out-of-Region counties, and the economic structure of the two areas.

Educational Attainment

In all four states, the counties in the Region exhibit lower median years of education attained than those in the states and in the counties outside the Region (see Table 10). The median number of years of education in the counties in the Four Corners Region ranges from 9.6 years – the figure for the counties of the Arizona portion of the Region – to 11.8 – the median for the Utah counties in the Region.

TABLE 10. EDUCATION FOR STATE REGIONS AND STATES, MEDIAN YEARS, 1960

	Arizona	Colorado	New Mexico	Utah
Region Counties	9.6	10.6	9.8	11.8
Other Counties	11.0	11.6	10.4	12.2
Total State	10.1	10.9	10.0	11.9

Source: U.S. Department of Commerce, Bureau of Census, *Characteristics of the Population,* 1960, Table 83.

Location

One of the more serious problems faced by the counties in the Four Corners Region is their relative isolation. In order to clarify this point, mileage distances were calculated to determine the proximity of various parts of the Region to various types of educational facilities, to different-size cities, and to the interstate highway system. Because it is impossible to calculate distances between some point of a linear feature and an area, the distances were calculated primarily between the largest political subdivisions in any two given counties, i.e., the county seat in most cases or a central community.

Educational Facilities

Of the 92 counties in the Four Corners Region, 21 are within 50 miles of a graduate school, 45 are within 50 miles of a 4-year college, and 61 are within 50 miles of a technical school. This 50-mile figure is an arbitrarily determined distance representing the probable maximum distance that a student could be expected to travel on a fairly consistent basis. Experience with commuting distances to schools indicates that once driving time exceeds approximately 1 hour, attendance becomes marginal and falls off rapidly. These figures indicate that less than half of the counties are within easy commuting distance of advanced academic programs and only two-thirds are within easy commuting distance of technical-training facilities.

Proximity to Interstate Highways

Thirty-seven counties in the Region are located within 50 miles of a north-south interstate highway, 26 are within 50 to 100 miles, and 29, or almost one-third, are over 100 miles away. This means that much of the Four Corners Region is beyond the point of easy access to major north-south trade centers. The interstate highway system is, of course, only one type of road under consideration, but because alternative centers are often narrow and circuitous, this system provides the best indicator of access.

The situation in regard to east-west interstate highways is perhaps worse, and is shown by the fact that 35 counties are over 150 miles from the nearest east-west interstate highway.

Proximity to Metropolitan Areas

Being close to metropolitan areas is significant in a general sense because cities of different sizes offer goods and services in different quantities. For example, while a city of 25,000 may offer only minimal medical, data-processing, or repair-parts services, a city of 100,000 is likely to have adequate services of this type.

In the Four Corners Region, only 22 counties out of the 92 are within 50 miles of a city with a population of 25,000 (see Table 11). Only 18 counties are within 50 miles of a city with 50,000 population and 13 counties are within 50 miles of cities with populations of, at least, 100,000 people. This means, of course, that most of the Region's counties are isolated in terms of supplies, markets, and business-supporting activities. This isolation may be a serious deterrent to the economic-development potential of the interior portion of the Region.

TABLE 11. PROXIMITY OF FOUR CORNERS REGION COUNTIES TO CITIES OF 25,000, 50,000, AND 100,000 POPULATION

Miles	Arizona	Colorado	New Mexico	Utah
		Proximity to City of 25,000		
0-50	2	9	8	3
50-100	2	11	11	3
100-150	4	12	3	6
Over 150	1	8	0	9
		Proximity to City of 50,000		
0-50	2	9	4	3
50-100	2	10	10	3
100-150	4	13	5	6
Over 150	1	8	2	9
		Proximity to City of 100,000		
0-50	0	7	3	3
50-100	4	12	7	3
100-150	2	12	7	6
Over 150	3	9	4	9

Source: "An Analysis of the Economic Structure and Industrial Potential of the Four Corners Region", Battelle Memorial Institute, 1970.

Economic Structure

When the economic structure of the Region is compared with that of the four states, the industry with the highest percentage of activity in the Region and the only one where the percentage of activity surpasses the four-state figure is mining (see Figure 2). Comparing the New Mexico portion of the Region with the State of New Mexico, the Region has a higher percentage of activity in all industries than any of the other three states. This could be explained by the fact that Albuquerque, one of the largest economic centers in the four states, is located within the New Mexico portion of the Region. Arizona and Colorado are similar in the industrial makeup of the Region versus that of the states. However, the Arizona portion of the Region has a lower proportion of its state's total employment than did the Colorado portion of the Region, which is caused primarily by the dominance of Phoenix. In Utah, the major differences between the Region portion and the State as a whole appear to be in the mining and agricultural sectors. That is, there were higher percentages of people employed in these sectors in the Region portion of the State than would have been expected if the employment was divided strictly upon a population-size basis. The major differences between economic structures of the Region Counties and the remaining Counties is shown in Table 12.

*In order to portray the characteristics of the Region as accurately as possible, a number of data sources have been utilized. For this reason, the information provided in Table 12 may not correspond precisely with that found in other tables.

TABLE 12. INDUSTRY EMPLOYMENT BY MAJOR SECTOR, REGION AND STATE, 1967

	Total Industry	Agriculture	Mining	Contract Construction	Manufacturing	Trans-portation	Wholesale Trade	Retail Trade	Finance	Services	Unclassified	Local Government	Federal Government
Arizona Region	44,707	221	3,395	2,748	6,277	2,005	1,843	10,383	1,818	8,718	23	6,308	7,095
Arizona	340,397	2,124	8,368	24,277	75,211	21,668	21,671	80,674	23,581	72,679	1,106	37,296	22,664
Colorado Region	109,704	275	3,381	6,628	20,320	8,144	5,832	29,135	5,838	24,555	182	17,769	13,185
Colorado	467,769	1,212	9,456	30,462	100,588	38,872	36,946	109,783	32,019	100,452	1,198	51,757	37,739
N. Mexico Region	129,696	363	5,038	12,473	13,333	10,996	8,676	32,221	7,701	36,114	471	15,555	17,984
New Mexico	174,758	689	13,403	15,700	17,429	15,564	10,874	44,420	9,995	43,369	615	22,033	24,264
Utah Region	39,899	121	3,438	2,285	8,657	2,466	1,394	10,287	1,270	8,025	91	6,860	2,184
Utah	209,420	402	10,706	12,063	46,321	15,276	17,941	49,723	12,678	41,162	691	23,284	32,497
Total Regions	324,006	980	15,252	24,134	48,587	23,611	17,745	82,026	16,627	77,412	767	46,492	40,448
Total, Four States	1,192,344	4,127	41,933	82,502	239,549	91,380	87,432	284,600	78,273	257,662	3,610	134,370	117,164

Source: "An Analysis of the Economic Structure and Industrial Potential of the Four Corners Region", prepared by Battelle Memorial Institute, Columbus, Ohio, 1970; percentages computed by Battelle Memorial Institute.

Income

One of the greatest areas of divergence between the Region and the total four-state area lies in the area of personal and household income. In terms of "aggregate groupings" of counties, there is little significant difference in median income between all of the Region's counties ($4,396), all of the four-states counties ($4,654), and the counties of individual states (Arizona, $4,907; Colorado, $4,524; New Mexico, $4,397; and Utah, $5,099). However, when the counties in the Region are compared with counties in a state outside the Region, and with SMSA counties, very large differences are observed. In the case of Arizona, the average median income for counties in the Region is $4,669, while a comparable figure for the remaining counties is $5,334, and for Arizona's SMSA counties is $5,793. In the case of Colorado, the average median income of the Region's counties is $4,135, that of counties outside the Region is $5,199, and that of Colorado's SMSA counties is $6,305. In other words, median incomes in SMSA counties are over half again as large as those in the Region. The situation in New Mexico is not quite so extreme, primarily because of the presence of Albuquerque and several other cities in the study area. Here, the average median income of the Region's counties is $4,289, that of other counties in the state is $4,632, and that of SMSA counties is $6,252. Lastly, essentially the same type of problem is observed in Utah where the average median income for regional counties is $4,887, that for other counties is $5,655, and that for SMSA counties is $6,165. These differences in income also are apparent when purchasing power per household is examined. In each of the four states, the per-household disposable income of counties in the Region is only three-fourths that of SMSA counties and only around 85 percent that of non-Region counties.

Leakage Analysis

In order to describe the economy of the study area as accurately as possible, and specifically to indicate areas for potential import substitution, an employment based input-output analysis was carried out for Arizona, Colorado, New Mexico, Utah, and the entire four-state area. Basically, input-output analysis involves dollar flows into a tabular organization of transactions in which the sales (outputs) of a producing sector are distributed across a single horizontal row, while that sector's purchases (inputs) are distributed down a single vertical column. An analysis of these tables shows in which sectors the states are realizing positive net flows of dollars from other states. The analysis also shows in which sectors the Four Corners states are losing money. It is with this latter group that import substitution may be possible and most beneficial to the Four Corners area economy.

As shown in Table 13 the major leakages or drains on resources in the study area is in manufacturing. Only two industries, primary iron and steel and certain types of electronic equipment, result in net flows to these states. However,

TABLE 13. LEAKAGE ANALYSIS FOR FOUR CORNERS STATES

(In Millions of Dollars)

ROW	DESCRIPTION	COL 1 TOTAL OUTPUT	COL 2 TOTAL REQUIRMNT	COL 3 NET LEAKAGE
1	LIVESTOCK•PRODS	677.116	772.432	-95.316
2	OTHER AGRI PRODS	1646.633	598.487	1048.146
3	FOR • FISH PRODS	82.343	59.713	22.631
4	AGRI•FOR•FISH SERVC	65.962	104.663	-38.701
5	FERROUS ORES MINING	350.428	45.291	305.137
6	NONFER ORES MINING	238.438	59.698	178.740
7	COAL MINING	66.551	83.009	-16.458
8	CRUDE PETROL•NAT GAS	1622.654	282.293	1340.361
9	STONE•CLAY MIN•QUAR	125.724	76.972	48.758
10	CHEM•FERT MINRL MIN	23.688	15.870	7.818
11	NEW CONSTRUCTION	2669.445	2882.683	-213.238
12	MAINTNC•REPR CONSTN	834.359	821.690	12.668
13	ORDNC•ACCESSORIES	448.878	202.451	246.427
14	FOOD•KINDRED PRODS	2225.562	2556.319	-330.748
15	TOBACCO MFRS	---	191.909	-191.909
16	FABRIC,YARN,THREAD	2.706	122.848	-120.142
17	MISC TEXT•FLOOR COV	.393	98.516	-98.124
18	APPAREL	151.686	634.561	-482.875
19	MISC FAB TEXT PRODS	23.570	103.680	-80.111
20	LUMBER•WOOD PROD	186.846	228.793	-41.946
21	WOODEN CONTAINERS	6.264	17.019	-10.755
22	HSHOLD FURNITURE	24.562	141.509	-116.947
23	OTHER FURN•FIXTURES	28.061	93.553	-65.492
24	PAPER•PROD•EX BOXES	52.430	272.459	-220.030
25	PAPERBRD CONTAIN•BXS	31.987	97.606	-65.618
26	PRINTING•PUBLISHING	234.456	344.410	-109.964
27	CHEM•SELECTD PRODS	189.730	394.899	-205.170
28	PLAST•SYNTHET MATRLS	2.452	68.513	-66.061
29	DRUG•CLEAN•TOIL PROD	25.187	318.855	-293.668
30	PAINT•ALLIED PRODS	19.902	65.942	-46.041
31	PETROL REFIN•REL PRD	264.523	795.914	-531.392
32	RUBBR•MISC PLAST PRD	161.580	260.217	-98.637
33	LEATHR•IND PRODUCTS	.121	18.193	-18.073
34	FOOTWEAR ETC	79.873	135.238	-55.365
35	GLASS•PRODUCTS	6.389	71.245	-64.856
36	STONE•CLAY PRODUCTS	414.580	415.401	-.821
37	PRIM IRON•STEEL MFRS	418.544	384.522	34.022
38	PRIM NONFER METALS	250.095	261.903	-11.808
39	METAL CONTINERS	22.348	71.255	-48.907
40	HTNG•PLUMBG•STRCTRL	222.587	338.679	-116.092
41	SCREW MACH PROD•STMP	24.687	87.147	-62.460
42	OTHR FAB MET PRODS	68.684	204.955	-136.272
43	ENGINES•TURBINES	25.031	81.882	-56.851
44	FARM MACH•EQUIPT	26.764	121.555	-94.790
45	CONST•MIN•O.F.MACH	111.117	165.147	-54.030
46	MTRLS HANDLING MACH	.350	55.660	-55.309
47	METALWORKING MACH	64.436	159.808	-95.372
48	SPECL INDUSTRY MACH	19.039	118.433	-99.394
49	GENL INDUSTRY MACH	39.821	149.385	-109.565
50	MACHINE SHOP PRODS	39.837	71.607	-31.770
51	OFF•COMPTG•ACCT MACH	289.039	254.205	34.834
52	SERVICE INDSTRY MACH	53.225	118.467	-65.242
53	ELECTEIR•IND EQUIPT	119.694	192.632	-72.939
54	HOUSEHOLD APPLIANCES	1.164	137.763	-136.599
55	ELECT LTNG•WTRG EQPT	17.683	106.992	-89.309
56	RADIO•TV•COMMUN EQPT	70.845	441.110	-370.264
57	ELECTRONIC COMPONENT	272.471	120.669	151.802
58	MISC ELECT MACH ETC	15.071	51.397	-36.326
59	MTR VEHICLES•EQUIPT	96.593	1170.462	-1073.869
60	AIRCRAFT•PARTS	166.707	643.052	-476.345
61	OTH TRANSPORT EQUIPT	35.329	173.295	-137.966
62	PROF•SCI•CONTRL EQPT	123.355	214.487	-91.132
63	OPT,OPHTH•PHOTO EQPT	34.690	107.757	-73.067
64	MISCELLANEOUS MFG	91.084	269.416	-178.333
65	TRANSPORT•WAREHSNG	1524.077	1503.951	20.127
66	COMMUN EX RADIO•TV	521.508	467.657	53.851
67	RADIO•TV BRDCSTING	2.557	1.160	1.398
68	ELEC•GAS•WTR•SAN SER	1574.558	1143.940	430.618
69	WHLSL•RETAIL TRADE	5333.899	4382.279	951.621
70	FINANCE•INSURANCE	1570.328	1580.313	-9.985
71	REAL ESTATE•RENTAL	1989.265	2195.433	-206.168
72	HOTEL•PTC EX AUT REP	1210.164	606.432	603.732
73	BUSINESS SERVICES	1285.897	1876.572	-590.675
74	RESEARCH•DEVELOPMENT	230.036	46.020	184.016
75	AUTO REPAIR•SERVICES	652.506	405.730	246.776
76	AMUSEMENTS	997.106	422.436	574.670
77	MED•EDUC•NONPROFIT	2345.267	1359.646	985.621
78	AGRICULTURE,FOREST,F	2472.054	1535.294	936.759
79	MINING	2427.483	563.132	1864.351
80	CONSTUCTION	3503.804	3704.373	-200.569
81	MANUFACTURING	7302.026	13923.686	-6621.659
82	TRANSPORTATION•UTILI	3622.701	3116.708	505.993
83	TRADE•FINANCE•REAL E	8893.493	8158.025	735.468
84	SERVICES	6720.977	4716.837	2004.140
85	TOTAL	34942.537	35718.054	-775.517

individual states vary widely in this respect, with ordnance and electronics bringing large sums to Arizona; ordnance, metals, and electronics bring substantial sums to Colorado; this same pattern exists with food products and metals in Utah. In New Mexico, no one sector appears to result in a significant inflow of cash. The services and trade tend to be much stronger in pulling funds to the Region.

Table 13 indicates the major input-output sectors in the Four-State area, and shows which activities are responsible for attracting capital to the study area, and which may result in net leakages of funds.

The key point that these tables demonstrate is that the manufacturing sector is clearly the area responsible for most funds leaving the area, and the area where development programs may have the greatest favorable impact on the Region.

CHAPTER 2. RESOURCES OF THE FOUR CORNERS REGION

INTRODUCTION

An analysis of the resources of the Four Corners Region is important because it bears directly upon the Region's developmental potential. By "resources" is meant the somewhat unique set of inputs to the manufacturing process which are found in the area in economically feasible quantities. In most cases, these are measurable and identifiable. This type of resource would include raw materials contributed by agriculture and mineral activities as well as the products and services of certain manufacturers which are consumed in the production process. Because of the relatively high share of total production costs accounted for by labor in most manufacturing activities, human resources are also examined in this section. An analysis of these resources — human, natural, and industrial — was used as an input to a determination of the Region's comparative advantages in attracting industry, as well as the barriers facing development in the Region. This analysis was also important in determining whether or not an industry which was considered desirable for the Region could, in fact, feasibly locate there.

HUMAN RESOURCES

Many factors must be considered when describing and assessing the human resources of the Four Corners Region. The factors discussed in this section include age structure, sex ratios, ethnic composition, urban-rural distribution, and educational attainment. These factors are discussed at the Region level. However, because of the great variability found in human resources in the Region, certain additional factors were discussed in the main report at the subregional level. These factors included such things as population growth, migration trends, labor-force participation rates, unemployment rates, industrial and occupational structure, and educational institutions present in the various subregions.

Age Structure

The age structure of a region's population is a good indicator of the state of that region's economy. When the age structure is portrayed in a graphic age profile, it provides a visual image of how a population has responded to living conditions. In a stable society, the age profile takes on the appearance of a pyramid, with the youngest and largest segment of the population at the bottom. The age groups get older and progressively smaller as one moves up the pyramid. In addition to the insight derived about the general economic situation, an age profile also provides an indication of the type of labor force one might find in a region's population.

Since there is a great deal of diversity among the city and county populations in the Four Corners Region, one profile for the agglomerated Region would be meaningless. Instead, profiles are shown for two very different counties — Apache County, Arizona, and Delta County, Colorado. Figure 4, the age profile for Apache County, portrays a population where Indians are in the majority. This profile is unique because, while it resembles what might be considered a "normal" pyramid, it does so for the wrong reasons. Apache County does not have an economic setting that is stable and prosperous, but there appears to be no mass out-migration among the young age groups which are usually mobile. This age profile is, however, also a bit bottom heavy, which is due to the high birth rates among the Indian population in that area. These high birth rates are not good for economic development because they withdraw women from the labor force and place serious financial and psychological pressures upon males. Also, the costs involved in raising families reduce various types of discretionary disposable income and may reduce expenditures for health and education by a family.

The age profile for Delta County (see Figure 5) represents an example of a county where the median age is fairly old and is becoming older. Here, the median age of the total population is 35.9 years. As can be seen through comparison, the profile of this County is different from that of Apache County, where the median age is 17.2 years and is becoming lower. This profile shows an abundance of older people, but more significant for this study is the clear lack of persons in

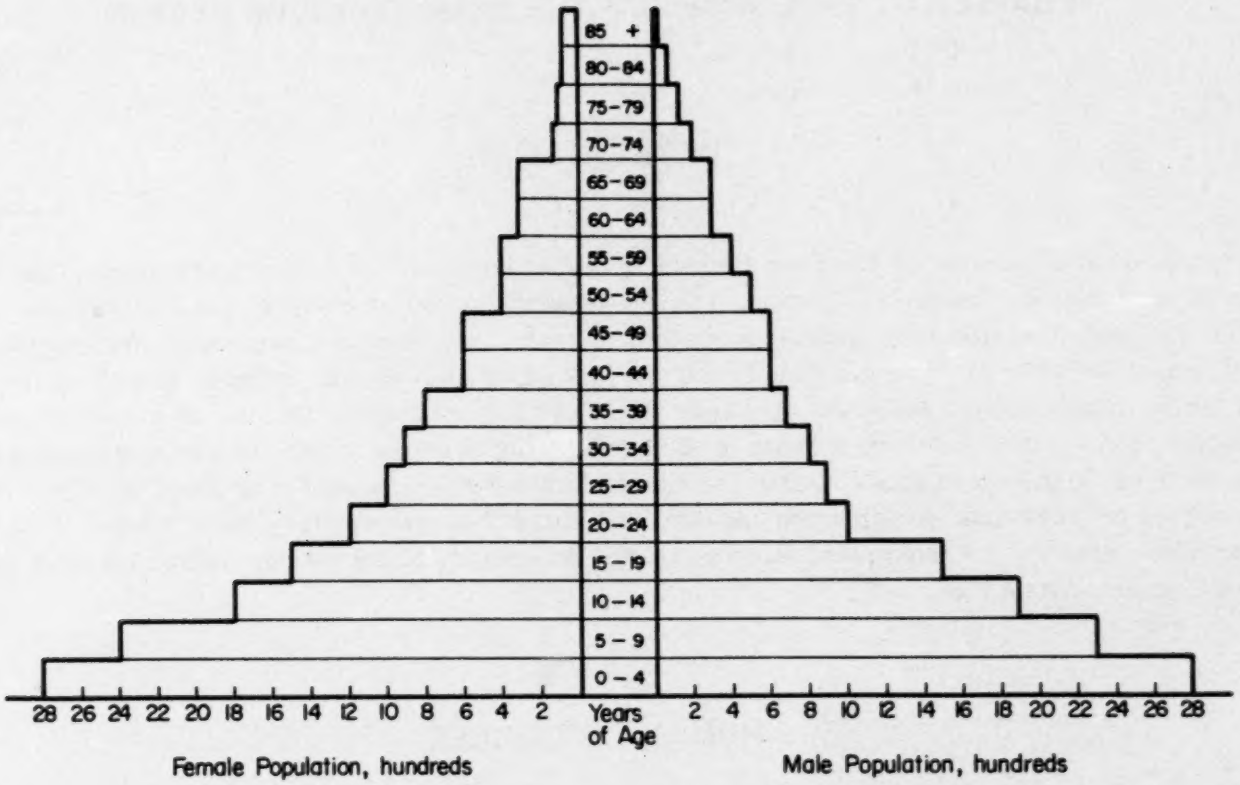


FIGURE 4. AGE PROFILE FOR APACHE COUNTY, ARIZONA, BY SEX FOR 1960

Source: *United States Census of Population,* Bureau of the Census, Department of Commerce, Vol 1, 1960.

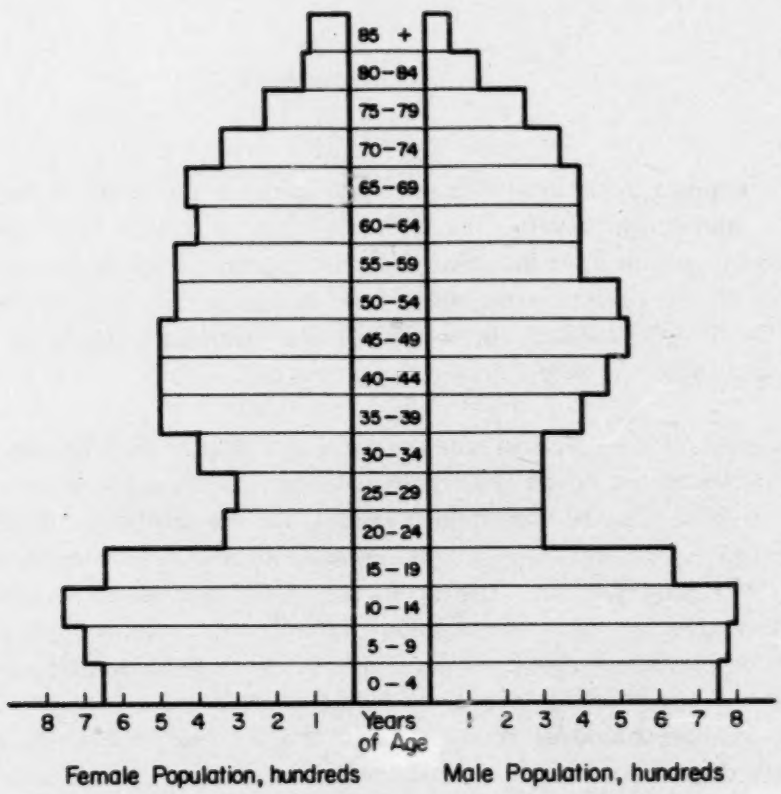


FIGURE 5. AGE PROFILE FOR DELTA COUNTY, COLORADO, BY SEX FOR 1960

Source: *United States Census of Population,* Bureau of the Census, Department of Commerce, Vol 1, 1960.

the most productive age range, 20 to 35. This is a clear indication of out-migration by young persons looking for jobs. This situation could persuade a potential employer to bypass this type of county, while the first pattern indicates an abundance of young (and trainable) workers.

Sex Ratios

The sex ratio of a region may be significant to an industry interested in employing a majority of one or the other sex. For example, an industry dealing with the extraction of natural resources would be interested in the male population. The reverse would be true for the textile industry, where many of the employees are female.

A sex ratio which is higher than one indicates there are more males than females in that particular population, while a ratio which is less than one shows that there are more females. As can be seen from Table 14, the sex ratio for the Four Corners Region is higher than one, which is a deviation from the United States' ratio.

TABLE 14. SEX RATIOS IN THE UNITED STATES AND THE FOUR CORNERS REGION, 1960

(Male/Female)

	Ratio
United States	0.97
Four Corners Region	1.02
Arizona Section	1.03
Colorado Section	1.02
New Mexico Section	1.01
Utah Section	1.02

Source: *United States Census of Population,* Bureau of the Census, Department of Commerce, Vol. 1, 1960.

This research identified two characteristics of male-female employment patterns which should be noted. First, at this time many jobs in the Region are services (such as stores or eating establishments) that employ more females than males and this has resulted in slightly unusual labor-force participation rates in the study area. Second, the female workers in the study area have proven themselves exceptionally adept at work requiring manual dexterity and careful assembly, such as electronics and apparel.

Ethnic Composition

The ethnic composition of an area's population has a definite bearing on the course of that area's industrial development. Special groups of people sometimes indicate the need for unique development plans. The varied distribution of Indians and Mexican-Americans throughout the Region, as seen in Table 15, further complicates the development problem in one sense, and could facilitate it in another. The utilization of ethnic populations has been clearly identified and involves problems related to language, transport, health, work habits, expectations, and social constraints. However, as this report clearly indicated, thoughtfully designed and executed development and training programs could serve to turn the Four Corners Region with its relatively high ethnic population into one of the most important "human resource" areas of the United States. The ethnic populations of these states should not be considered barriers to development, but instead, an extremely desirable resource to be developed.

TABLE 15. PERCENT DISTRIBUTION OF POPULATION BY ETHNIC GROUP FOR FOUR CORNERS REGION, 1960

	Indian	Spanish Surname
Four Corners Region	7.2	18.7
Arizona Section	25.3	15.9
Colorado Section	0.4	13.8
New Mexico Section	8.0	30.6
Utah Section	2.0	0

Source: *United States Census of Population,* Bureau of the Census, Department of Commerce, Vol 1, 1960.

Urban-Rural Distribution

There are 44 counties out of the 92 in the Region which have no urban population. The definition of urban, in this case, is a town of at least 2500 people. A situation like this presents a real problem to development on a large scale, mainly because the potential employees of a new industry are so scattered. This type of sparse population indicates the need to concentrate on the types of industries that employ only a few people.

Educational Attainment

Probably the most relevant characteristic in this analysis of human resources is educational attainment. Although a direct correlation does not exist between educational attainment and the skill level for employment, it is one of the better indicators of available skills.

Comparing the figures describing educational attainment for the Four Corners Region with the United States distribution of educational attainment, one discovers that the people of the Region are much better educated than the citizens of the United States as a whole. Table 16 shows the distribution of the different levels of educational attainment of the population over 25 years of age in the United States and the Four Corners Region in 1960.

TABLE 16. EDUCATIONAL ATTAINMENT OF POPULATION OVER 25 YEARS IN THE UNITED STATES AND FOUR CORNERS REGION, 1960

(Percentages)

Grades Attained	United States	Four Corners Region	Arizona Portion	Colorado Portion	New Mexico Portion	Utah Portion
0-8	39.7	35.8	46.3	36.1	35.9	23.5
9-11	19.2	18.8	18.9	18.4	17.2	24.5
12	24.6	25.9	20.0	27.4	25.1	30.1
13-15	8.8	10.8	8.0	10.3	11.2	13.8
16+	7.7	8.7	6.7	7.9	10.5	8.1

Source: *United States Census of Population,* Bureau of Census, Department of Commerce, 1960, Table 83.

Labor-Force Participation Rates

As can be seen from Table 17, the labor-force participation rates in the Four Corners Subregions are generally lower than the United States' aggregate figure of 55 percent. Even though these participation rates appear to be quite low, they do not give the complete picture of the skill-level and number of the labor force available for new jobs. In Chapter 1, Table 6 showed the occupation distribution of those already employed in the Region. The types of occupations where the Region compares favorably with the United States' distribution are generally in the "skilled" category. In almost every subregion, there appears to be a number of people who are available for training. In other words, the population of the Four Corners Region should be considered a valuable resource by almost any industry which is looking at the Region as a possible new location.

TABLE 17. LABOR-FORCE PARTICIPATION RATES IN THE FOUR CORNERS SUBREGIONS AND THE UNITED STATES, 1968

		Labor-Force Participation Rate, %
Arizona*		
Subregion 3	(Coconino)**	26
Subregion 4	(Mohave)	39
Subregion 5	(Gila)	32
Subregion 6	(Graham)	32
Colorado		
Subregion 2	(Denver)	42
Subregion 3	(El Paso)	32
Subregion 4	(Pueblo)	35
Subregion 5	(Alamosa)	37
Subregion 6	(La Plata)	39
Subregion 7	(Mesa)	39
New Mexico		
Subregion 1	(San Juan)	33
Subregion 2	(Taos)	33
Subregion 3	(Bernalillo)	33
Subregion 4	(Curry)	34
Subregion 5	(Grant)	37
Subregion 6	(Chaves)	35
Utah		
Subregion 4	(Utah)	33
Subregion 5	(Sevier)	38
Subregion 6	(Iron)	40
Subregion 7	(Uintah)	37
Subregion 8	(Grand)	35
United States		55

Source: Edward Heler, Project Director, *The Four Corners Manpower Report,* 1969, Statistical Appendix.

*Refer to Figure P-1 for the location of these Subregions.

**County in parentheses is regarded as the core county in the Subregion.

PRIMARY RESOURCES

Both agricultural and mineral resources are important inputs to economic activity in the Region, and may in the future be even more important. The most important types of these resources are noted below.

Agricultural Resources

In the Rocky Mountain portion of the Region, because of the relatively unfavorable costs, climate, and terrain, crops and livestock are of limited economic significance. Hay is an important fodder crop for local cattle, and alfalfa, lettuce, potatoes, and other vegetables are also grown. Sheep are also raised to supplement cattle which are important locally. Ponderosa and lodgepole pine are also important, and form the basis for a number of forest-related activities, especially sawmills and lumbering camps.

In the Colorado Plateau part of the Region, aridity is a problem, and grasses to support grazing are of major agricultural importance. The raising of both cattle and sheep are of greatest importance here. Again, forestry is important (relatively) in many counties.

In the Basin and Range province, a number of irrigated locations (such as Phoenix and Salt Lake), provide major production areas for cotton, alfalfa, citrus, and other fruits and vegetables. Most of this production is used to serve local needs. In the Great Plains part of the Region, agricultural land uses are dominated by grazing and the growing of wheat.

The major crops produced in the Region that produce export income are cotton, citrus, vegetables, and sugar beets. Exports of cattle and sheep products are also major sources of income for the Region farmers. Lumbering is important throughout most of the Region, and many wood products are also exported. The major industries that might be attracted to these products include food processing, leather and wool producers, and lumber-wood-paper producers.

Minerals

The Region is one of the most well-endowed mineralized zones in the United States. The major types of minerals extracted in the four-state area are summarized below in Table 18. Unlike other resources in these states, most of these minerals are found in the Region and present significant potential for development. Many types of electrical equipment and electronic equipment, chemicals, steel, machinery, and other types of manufacturers could be drawn to the Region because of the availability of these minerals.

TABLE 18. MAJOR MINERALS OF THE FOUR CORNERS STATES, 1967

(Ranked According to Value of Output, in Millions of Dollars)

	Arizona		Colorado		New Mexico		Utah	
Rank	Mineral	Value	Mineral	Value	Mineral	Value	Mineral	Value
1	Copper	383.6	Petroleum	99.0	Petroleum	368.4	Copper	128.9
2	Sand and Gravel	17.0	Molybdenum	84.7	Natural Gas	138.8	Petroleum	63.2
3	Molybdenum	15.4	Coal	26.0	Potassium Salts	91.1	Coal	24.3
4	Petroleum	8.2	Sand and Gravel	23.0	Uranium	89.6	Lead	15.1
5	Silver	7.1	Uranium	20.3	Copper	57.3	Iron Ore	11.9
6	Zinc	4.0	Natural Gas	15.5	L.P. Gases	40.0	Uranium	10.3
7	Stone	3.5	Zinc	14.5	Natural Gas	20.7	Zinc	9.5
8	Lime	3.1	Vanadium	14.2	Sand and Gravel	14.3	Sand and Gravel	8.6
9	Gold	2.8	Lead	6.1	Coal	12.6	Stone	7.6
10	Helium	2.0	Stone	5.5	Zinc	5.9	Natural Gas	6.5
State Total		463.9		346.3		874.1		354.5

Source: Minerals Yearbook, Vol. III (Area Reports), 1967.

Industrial Resources

Profiles of manufacturing in the Region are presented in Tables 19 and 20. These show how total manufacturing employment is distributed among the various manufacturing groups. In the Region, seven industries account for almost three-fourths of the total employment (73.5 percent). These are, in order of importance: the manufacture of food products (18.6 percent), primary metals (13.5 percent), lumber and wood products (11.8 percent), electrical machinery (9.0 percent), apparel (7.5 percent), stone, clay, and glass products (6.9 percent), and the manufacture of nonelectrical machinery (6.2 percent).

TABLE 19. COMPARISON OF MANUFACTURING IN THE REGION TO THE FOUR-STATE TOTAL

(By SIC, or Percentage of Total Manufacturing Employment)

SIC	Percent of Total Manufacturing Employment in Region	Rank	Percent of Total Manufacturing Employment in Four States	Rank	Percent of Total Manufacturing Employment in United States	Rank
19 Ordnance	.6	18	2.3	14	1.4	19
20 Food products	18.6	1	18.7	1	9.6	1
21 Tobacco products	.0	21	.0	21	.5	21
22 Textiles	.4	20	.2	20	5.1	9
23 Apparel	7.5	5	4.9	10	7.5	5
24 Lumber & wood products	11.8	3	5.0	9	3.3	13
25 Furniture products	1.4	15	1.6	15	2.2	16
26 Paper & allied products	.8	17	.9	18	3.4	11
27 Printing & publishing	5.7	8	7.2	4	5.3	8
28 Chemicals & allied products	2.2	12	2.8	11	4.3	10
29 Petroleum	1.4	14	1.4	16	.9	20
30 Rubber products	.9	16	1.4	17	2.4	14
31 Leather products	.5	19	.6	19	1.9	17
32 Stone, clay, & glass products	6.9	6	5.7	8	3.4	12
33 Primary metals	13.5	2	6.2	6	6.6	6
34 Fabricated metals	5.2	9	5.8	7	6.4	7
35 Machinery	6.2	7	11.5	3	8.6	4
36 Electrical machinery	9.0	4	11.9	2	8.9	3
37 Transportation equipment	3.1	10	6.9	5	9.4	2
38 Instruments	1.6	13	2.5	12	1.7	18
39 Miscellaneous	2.6	11	2.4	13	2.3	15

Source: Taken from figures compiled by Battelle Memorial Institute, Columbus Laboratories.

The top seven industries for the entire four-state Region account for 68.2 percent of total manufacturing employment. These industries include: the manufacture of food products (18.7 percent), electrical machinery (11.9 percent), nonelectrical machinery (11.5 percent), printing and publishing (7.2 percent), transportation equipment (6.9 percent), primary metals (6.2 percent), and fabricated metals (5.8 percent).

The differences between these two groupings is greater than is apparent at first glance. The top activities in the Region which are not so highly ranked in the four-state total tend to be generally less desirable for developmental purposes. That is, apparel, lumber and wood products, and stone-clay-glass products are all low-wage, low-growth, and low-skill activities. On the other hand, the three important industries in the states but not the Region include printing and publishing, fabricated metals, and transportation equipment. In short, not only is the industrial structure of the Region dominated by a smaller number of activities to a greater extent than the four states, but these also tend to be less desirable types of activities.

TABLE 20. COMPARISON OF MANUFACTURING EMPLOYMENT STRUCTURE OF THE REGION, SELECTED COUNTIES, AND THE UNITED STATES

(By SIC, or Percentage of Total Manufacturing Employment)

SIC	Percent of Total Manufacturing Employment in Region	Rank	Percent of Total Manufacturing Employment in Region Non-SMSA Related Counties	Rank	Percent of Total Manufacturing Employment in United States	Rank
19 Ordnance	.6	18	.0	20	1.4	19
20 Food products	18.6	1	21.4	1	9.6	1
21 Tobacco products	.0	21	.0	21	.5	21
22 Textiles	.4	20	.6	18	5.1	9
23 Apparel	7.5	5	7.4	5	7.5	5
24 Lumber & wood products	11.8	3	13.6	2	3.3	13
25 Furniture products	1.4	15	1.6	14	2.2	16
26 Paper & allied products	.8	17	1.1	15	3.4	11
27 Printing & publishing	5.7	8	6.2	8	5.3	8
28 Chemicals & allied products	2.2	12	2.2	11	4.3	10
29 Petroleum	1.4	14	1.7	13	.9	20
30 Rubber products	.9	16	1.0	16	2.4	14
31 Leather products	.5	19	.6	17	1.9	17
32 Stone, clay, & glass products	6.9	6	6.5	7	3.4	12
33 Primary metals	13.5	2	8.0	4	6.6	6
34 Fabricated metals	5.2	9	4.9	9	6.4	7
35 Machinery	6.2	7	6.6	6	8.6	4
36 Electrical machinery	9.0	4	10.8	3	8.9	3
37 Transportation equipment	3.1	10	2.9	10	9.4	2
38 Instruments	1.6	13	.5	19	1.7	18
38 Miscellaneous	2.6	11	2.2	12	2.3	15

Source: Taken from figures compiled by Battelle Memorial Institute, Columbus Laboratories.

Figure 6 shows the employment distribution for the most important industry in the four-state area. It is included here because it graphically portrays the most pervasive point about the distribution of industry in this area: the concentration of manufacturing in the major SMSA's.

Other Comparative Advantages

When compared with other areas in the western portion of the country, the Region has a number of comparative advantages in attracting economic activity. These are factors which would serve to attract a particular firm to the study area as opposed to locating elsewhere, and include economic as well as social considerations. The more important comparative advantages accruing to the Region include:

Human Resources. Overall, the most important resource available to the Region is its human resources. Other areas of the nation which have experienced considerable growth due to the productivity of their workers are, in many cases, at a disadvantage when compared with the Region. The following characteristics pertain to the human resources of the Region.

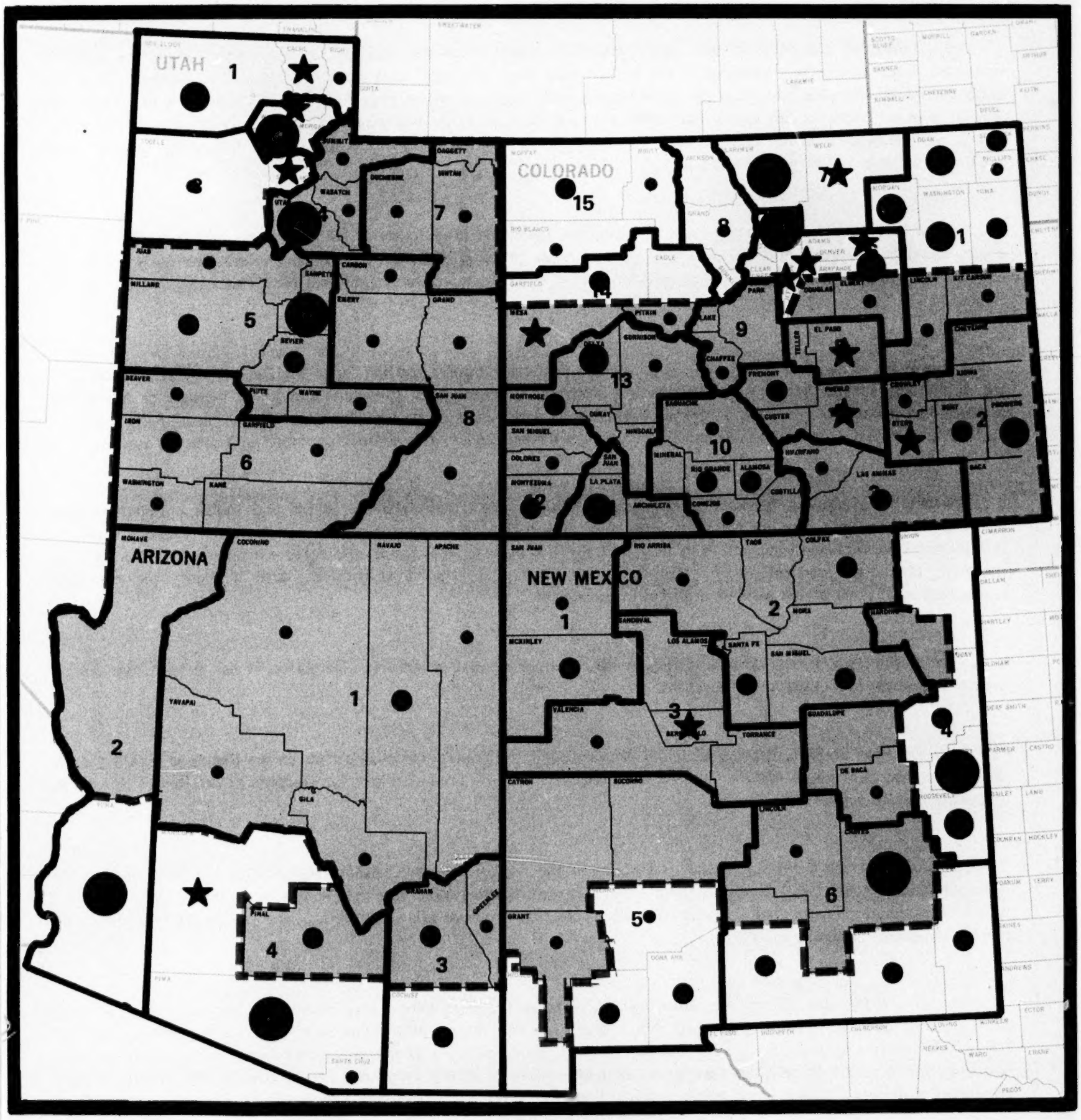


FIGURE 6. THE DISTRIBUTION OF THE FIRST RANKING INDUSTRY IN THE REGION, FOOD PRODUCTS

BATTELLE MEMORIAL INSTITUTE – COLUMBUS LABORATORIES

Low Levels of Unionization and Few Labor-Management Problems. Outside of disturbances in several mineral industries, labor-management relations in the Region have been favorable, with few disruptive strikes. Workers often feel pride and loyalty to jobs and employers, and several firms that have moved recently to the study area indicated that the Region is much better in this regard than their previous locations in the manufacturing belt. In many areas, unionization is not well developed, which may or may not be preferable to some firms. However, where unions are present, they usually function in a very productive capacity.

Reasonable Wage Levels. Owing to competition for labor and lower costs of living, workers outside the SMSA's are often available at wages which support desirable standards of living while being significantly less than elsewhere in the country. In many cases, savings in wages will more than compensate for any additional costs related to transport in the Region.

Large Pools of Workers. While very large plants might have trouble staffing up in the Region, at many locations in the study area substantial pools of workers are available. In most cases, these are semiskilled workers or low-skilled workers, but persons with unique occupational experience and high skills are available. One characteristic of the Region is that many ex-residents who have left and have improved themselves are very desirous of returning if jobs are available.

Availability of Special Skills. The population of the Region, especially the ethnic and Indian populations have demonstrated that they have unique skills. Both men and women have proven that they are skilled in industrial work (or in electronics assembly and apparel), and may be trained to operate all types of automated equipment. Unfortunately, in the past, about all descriptions of these workers have had a negative orientation, even if these have *not* been representative of most of the workers available in the Region.

Accessibility to Markets. While the Region may seem somewhat isolated at first glance, it has at least two unique proximities which may assist in development.

Location Near SMSA's. Because of its location and definition, a plant choosing a site in the Region is within 1 day's drive of no less than seven SMSA's. These present relatively wealthy urban markets for products of the Region, as well as sources of needed supplies and services.

Location Near the California Market. Locations in the Region are often within 1 day's truck-transport time of the extremely wealthy and large (about 30 million persons) West Coast market. Not only is this an extremely large market in terms of personal demand, but concentration of electronics, transportation equipment, and machinery manufacturing present important industrial markets.

IMAGE and Physical Desirability. The Region is often perceived as being a very beautiful, climatically desirable area, generally free from congestion and urban dirt and sprawl. The Region often conveys a relaxed living atmosphere that blends Western and Mexican life styles. The climate and "good life" view of this area may or may not be combined with opportunities for outdoor activities such as hunting, skiing, and camping. Few areas of the country offer such a unique combination of urban activities and outdoor-related benefits. There is also a human side to this advantage, as people from the Region are often assumed to have a degree of "honesty" and rugged individualism not found elsewhere. Major centers such as Phoenix, Salt Lake, Denver, and Albuquerque are also perceived as being very exciting growth centers.

In terms of specific physical advantages, the Region does offer climatic and physical features that rival those associated with such states as Florida and California. Because of its climate and small use of coal for heating, the states in the Region are perceived as, and are, cleaner and often less polluted than many other states.

Specialized Industrial and Research Structure. The Region (and its contiguous area) has an industrial structure that is not only conducive to desirable industrial linkage but is also responsible for developing specific pools of extremely highly

skilled workers. The electronics and instrument manufacturers in the area provide valuable inputs to a number of other activities paying high wages and requiring high skills. The Region also boasts several research and development facilities, both governmental and private, that could provide a take-off push for a number of technically sophisticated activities. These activities could lead to a large group of other types of firms being attracted to the Region.

Transportation. While transport is a problem in some of the Region's counties, others are well served by major transcontinental highways, raillines, and trucking firms. Further, the larger cities in the Region and on its periphery are major focal points of air service.

Land Costs and Sites. While commercial and industrial buildings are in short supply in parts of the Region, good sites are often available in communities which offer adequate labor and amenities. Outside of the major SMSA's, the costs of land are favorable. Operating costs such as sewage, water, taxes, and insurance are also comparable to those in other areas. While the Region may have an arid climate, water supplies are adequate for most industries. What is often not fully appreciated is the fact that selected locations have access to very large quantities of water, as well as power and fossil fuels.

Aids to Industry. Because of the influence of governmental agencies in the Region, a number of programs, in transport and land management for example, could markedly assist in developmental efforts. Also, there are literally scores of programs available to assist the economic and social development of Indian and other ethnic groups.

CHAPTER 3. POTENTIAL BARRIERS TO ECONOMIC DEVELOPMENT IN THE FOUR CORNERS REGION

INTRODUCTION

The resources and economic setting discussed in Chapters 1 and 2 of this report identified a number of activities that might be considered industry prospects for locations in the Four Corners Region. When the so-called "footloose" industries, those that are able to locate almost anywhere because of the relative permissiveness of their inputs, are added to the activities noted earlier, a relatively substantial array of potential industries for the Region takes form. Barriers are those factors influencing economic development that are amenable to change and modification through concerted effort. Comparative disadvantages, on the other hand, would include those factors on which human effort and developmental programs will have either little impact, or wherein extremely long-range processes are involved. For example, the fact that the Region may be deficient in certain types of industrial financing is clearly a barrier; the fact that the Region is characterized by an extremely irregular topography should be considered a type of comparative disadvantage.

Barriers in Perspective. No region enjoys a perfect combination of circumstances from the point of view of the industrial concern seeking a "best" location. If no region is ideal in every respect, then it follows that every region has certain deficiencies or drawbacks that tend to retard the pace of industrialization. Some areas have more barriers than others. Some parts of the Four Corners Region have an above-average number of barriers, while other sections would easily satisfy the requirements of most industries. Due to substitutability of inputs for any industry, what may appear to be a barrier to economic development when viewed in general terms may in reality dissuade few industries from locating in the Region.

Most of the barriers discussed in this chapter are interrelated to a large degree. A shortage in the Region of labor, amenities, transport, educational facilities, and economic linkage will reflect a sparse population distribution. In most of the counties found in the study area, the number of people present is so low that the thresholds or entrance levels required to support business-serving activities are not reached. However, these disadvantages are not so serious and may be completely absent in counties contiguous to the major cities on the periphery of the Region; consequently, geographic and subregional differences must be considered when reviewing this discussion. In the discussion that follows, barriers are examined that have been identified as significant for the Region. Further, individual states are examined because the impact of a barrier may differ significantly among parts of the Region.

BARRIERS TO ECONOMIC DEVELOPMENT

Arizona

Discussed below are barriers to industrial development which are significant for the Arizona portion of the Region.

Supply of Trainable Labor. The Four Corners Region is characterized by inexpensive, nonunionized labor. Unions are not a major force within the Region and Arizona is a right-to-work state. This, together with the Region's large pool of unskilled or low-skilled labor, makes the Region particularly attractive to manufacturers of apparel, electronic apparatus, and other high-labor-content products. Settlements within the Region tend to have a nucleus of trainable labor. Problems usually arise when a firm tries to expand its labor force beyond this nucleus or when several firms compete for this finite labor resource.

The labor barrier has three principal components: turnover, absenteeism, and communications.

Turnover. Most of the towns in the Region have substantial numbers of transients. People will settle for a few weeks or months and then move on. Sometimes the particular place simply loses its appeal. Several employers feel that they lose male employees because homesick wives insist that the family move back home. Employers with large numbers of female employees are often faced with a husband problem. The high turnover rate of minority employees, especially Indians, is an often-heard complaint. The reaction of individual employers is quite variable; some employers say that they cannot afford to hire Indians even if the Federal Government were to subsidize training costs. A firm employing large numbers of Indians claims that, when trained, Indians are both loyal and productive employees. Somewhere between these two extremes is the employer of 60, including one or two Indians. The reaction of this employer is that the Indian employee is among his best and if he could have 59 other Indians who were as good he would not mind having an all-Indian work force. In other words, this Indian has met Anglo standards and has, most likely, been "de-Indianized".

Absenteeism. A second problem is absenteeism. Even the senior employees may frequently, and sometimes without notifying their employer, be absent from work. Two general observations can be made about absenteeism: (1) it knows no ethnic bounds – reasons may vary from ethnic group to ethnic group but the net result is the same, (2) quite often no action is taken against even those employees with unexplained absences because many employers feel it is less expensive to put up with occasional absenteeism than to train a new worker who will probably be no more dependable than his predecessor, i.e., employers have learned to live with absenteeism.

Communications. Whenever employer and employee do not speak the same language, communications problems can arise; in Arizona significant numbers of the Mexican-American and Indian populations speak English only as a second language.

A more serious problem in communication is that of feedback, which is associated with the Indian population. Many employers claim that Indians are unresponsive, e.g., they will listen to your instructions but you are not sure whether they understand until they try to carry out your orders. Firms with expensive equipment often feel that they cannot afford to take a chance on Indians.

Supply of Skilled Labor. At this stage of the Region's development there is a shortage of low-skill assembly workers. Since this type of work has a short history within the Region, employers find that virtually every employee must be trained on the job. Training costs can act as a barrier to the establishment of firms that are unwilling or unable to accept this obligation. A good many of the jobs within the Region at present are of the low-skill variety. In most cases firms recruit local residents and then train them for some task on the job.

Many types of high-skill workers are presently in short supply. In terms of the current demand, this is a minor barrier, but it would certainly become a major barrier if the Region were to see an influx of firms requiring a more sophisticated work force. Most employers now fill their need for toolmakers and other skilled workers in two ways: (1) they train local workers and (2) they import workers from elsewhere in the state or nation. Even the successful recruiter, however, is inconvenienced, especially when the lag time between recruitment and employment is 3 or 4 months.

While the small pool of highly skilled labor might discourage employers, it also discourages the in-migration of skilled workers without prior job arrangements. The worker knows that even if he finds a job and is later laid off, he will probably have to leave the Region to find a job requiring his skills. The supply of skilled labor in Arizona's portion of the Four Corners Region is small compared with that in the rest of Arizona and in the entire United States. The absence of many types of skilled labor could act as a force to discourage an influx of firms requiring a skilled-labor input and workers who possess special talents.

Availability of Existing Industrial Buildings. A shortage of existing industrial buildings can retard growth in that firms that are unwilling or unable to build their own plants are excluded from the Region. At present, firms which are in the area on a trial basis and those that cannot afford to build their own plants have moved in to the few buildings that do exist. One firm, for example, has set up in an old frame building that was originally built as part of an Army training center during World War II, while another firm found that its needs were at least temporarily met by an ancient armory. Several of the employers who were interviewed indicated that the fact that they could find an existing building that met

their needs greatly influenced their decision to locate within the Region. At present the stock of vacant industrial buildings is low. An increase in the number of buildings available for lease would make the area attractive to firms anticipating a move to the southwest, especially those firms that are presently unable to finance a new building and those unwilling to make a large permanent investment in the Region.

Housing. Even in the larger communities within the Region, sound housing is in short supply; when adequate rental or sale housing is available, it generally commands a high price. While this can be an annoyance to managerial personnel, it can be a major problem to the firm that is interested in importing workers. For example, the manager of a plant in one of the Region's larger towns recently was faced with the problem of increasing output to meet the rising demands of his West-Coast customers. His ads in southern California and Arizona newspapers produced an adequate number of qualified job applicants, yet many of these applicants refused jobs because of the lack of sound housing at a price they could afford. Housing on Indian reservations is more than just hard to find; it is often nonexistent. None of the towns on the Region's Indian Lands are large; an employer must draw his workers from a wide area. Since housing is scarce and sound housing is at a premium, the firm may literally be required to build a city before it can start production.

Access to Materials. A majority of the manufacturers within the Region rely upon materials from distant sources, often the eastern United States. Distance alone accounts for a time lag between the date of shipment of materials or spare parts and the date of their receipt. In the case of small and isolated communities that do not have transcontinental truck service, additional time is lost in Phoenix where shipments are transferred to intrastate carriers for the last leg of their journey. Many of the manufacturers now located in the Region are willing to pay a premium for transportation so that they might minimize labor costs or tax costs. Inefficiencies in access can erode these savings. Lost production due to delays in the receipt of materials and replacement parts can be expensive, especially if dollar penalties or cancelled orders result.

Access to Markets. Access to markets, access to materials, and rail, air, and highway access are all interrelated; persons interviewed often integrated some or all of the five factors into their discussion of regional access. Several of the firms that were interviewed said that access to the southwest market, and especially to Los Angeles, together with the absence of an Arizona inventory tax, gave the Region a strong market position. Firms that serve national markets from the Region are generally those that balance transportation diseconomies against labor economies. Nevertheless, access to markets can be a barrier to industrial development in that isolation is a barrier to market development and cost distance is relatively great. Small Arizona-based firms may find it difficult to break into eastern markets because of Arizona's isolation, but isolation is less of a barrier to runaway plants that have already established eastern markets, firms with a branch in the Region that are headquartered in the East, or those firms that are affluent enough to support market-expansion programs.

In addition to the relatively high-cost distance from Arizona to eastern markets, the Region's producers are charged a premium for West to East shipments on public carriers, and quality of service to distant markets is a third component of this barrier.

Highway Access (Including Trucking). Although distance between towns is often great, highway access to the Region's principal settlements ranges from good to excellent, but in spite of the generally good highway access, there are some areas that are relatively inaccessible, and frequent complaints are heard about the quality of truck service even in areas well served by highways. At present, two areas which suffer from inadequate highway access are Lake Havasu City and the Navajo and Hopi Reservations in the northeastern corner of the Region.

A frequently heard complaint from firms throughout the Region is with regard to the quality of commercial truck service. The widespread sentiment was that the State's system of awarding trucking franchise reduced competition to the point that truckers could be indifferent to the demands of their customers. Several firms claimed that trucking delays cost them money and, on occasion, customers. Several of the employers interviewed said that they had been attracted to the Region, in part, by the promise of overnight truck service to Los Angeles, a promise which, they claim, has not been kept.

Air Access. Most cities within the Region are linked to Phoenix and transcontinental air service by at least one flight daily. Nevertheless, there is some dissatisfaction with the quality of air access. Complaints about air access generally focused on (1) the complete absence of commercial air access in several areas, and (2) the infrequency of flights and the difficulty of making connections to distant points from those cities that have commercial air service.

Regional Image. The Region, by and large, is not thought of as a strong contender for industry. Even Arizonans living outside of the Region tend to see this portion of the State as a place to escape the desert's summer heat or as a picturesque area to explore for a week or two. Out-of-staters often assume that the entire State is a desert best suited for winter vacations. Not all observers see the Region in terms of bucolic charm. Local businessmen claim that outsiders and especially Arizonans from the southern part of the State tend to characterize their communities as dirty, isolated railroad or highway towns. The Indian reservations too are negatively perceived; their image is one of strikingly attractive yet unproductive landscapes peopled by an unredeemable poverty class.

Quality of Schools. In general, people within the Region consider their schools to be of a high quality. This opinion appears to be confirmed by data on educational expenditures for the Region's counties. However, it should be remembered that the federal contribution to education is sizable, especially in areas with large Indian populations. In spite of the general satisfaction with the school system, its effectiveness in areas with substantial minority populations is questioned by local residents. There is some concern that Indians and Mexican-Americans are not adequately instructed in the values of the Anglo world and, therefore, come out of school still unable to accept the responsibilities of twentieth-century America. Vocational training, many felt, could be expanded to give the skill necessary for success in an evolving society.

Colorado

In spite of the significant growth that has occurred in the State, the portion of Colorado of the Four Corners Region has an above-average number of barriers. These are:

Image of the Region. Many people conceive of the Region as being arid, hot, uncomfortable, stark, and inhospitable which is the traditional view of lands classified as arid. However, while the total Region presents a hot, arid, desert image, the Colorado portion of the Region does not suffer from this image. Colorado Springs, the major Colorado city located in the Region, has an extremely favorable image and the overall Colorado image is one of mountains rather than desert. There was a reasonable amount of concern on the part of export firms in the 10 to 50 employment category about the image of the Region. Three listed it as a major barrier, and six listed it as a minor barrier.

The Problem of Public-Held Land. One of the major characteristics of land ownership in the Colorado portion of the Four Corners Region is the role of government. Public ownership accounts for 41.6 percent of the land in the Region; private ownership, therefore, accounts for 58.4 percent. The 16 eastern counties have substantially lower levels of public ownership, while the 24 western counties are dominated by public ownership, with percentages ranging from 31.2 percent in Alamosa County to 95.5 percent in Hinsdale County.

In an area as large as the 40-county Four Corners Region where such a large portion of the land is federally owned, it can easily be seen that the long-run future development of the Region might be different in terms of whether or not the land is federally or privately owned. The land that contains the major possibilities for increased future economic benefits are under Federal Government control — land that may yield water, oil, minerals, timber, and recreation.

Problems Related to the Ethnic Composition of the Region. The ethnic-composition problems can be considered both as an asset and a liability in the Four Corners Region. The presence of the Mexican-Americans and Indian minority groups represents a ready and trainable supply of labor; however, the basic problem is to raise their educational attainment and skill levels to meet the needs of modern industry. Regardless of one's personal feelings or social views, there is no question but what areas with large minority groups discourage the location of industry (in Colorado, with the exception of the Denver area, the minority groups are concentrated in the Four Corners Region portion of the State).

The large Mexican-American population presents a barrier owing to these individuals' nonconformity to the Anglo's concept of the work environment, largely because of cultural considerations. Anglo middle-class institutions centered on individual mobility, personal acquisitiveness, and the drive to get ahead are simply not consistent with the drives and heritages of the Mexican-American or Indian. For the Mexican-American, the family is the main focus of social identification. Materialism, mobility, and "Anglo rational economic behavior" only uproot an individual from his culture. From the industrial-development standpoint, the culture and institutions of these groups are impediments to progress, job opportunities, and social mobility in our material world. One of the deficiencies of the Mexican-American in terms of industrial development is education. One of the problems here may be an inadequate command of the English language – the language of both the school and job instructional program. Failure due to the communication problem can lead to low self-confidence and repeated frustration, resulting in a high drop-out rate.

Lack of Financial Resources. One of the major barriers facing economic development in the Four Corners Region is that of obtaining the investment capital necessary for the Region's economic development. Capital and financial availability are common rural development constraints. Much of the Region depends on the extractive industries and modest trade and service activity with little manufacturing. Consequently, without an economic base sufficient to generate considerable export activity it is not possible to generate enough internal capital for development needs.

Capital in the form of buildings, machinery, and equipment is needed for all production processes; however, some industries are more capital intensive than others. It appears that the majority of important economic activities in the Region are capital intensive (as measured by the capital-per-worker ratio) and becoming more so, further compounding the problem. In addition to venture capital for business and industrial expansion, there is a need for social-economic capital – capital for housing, education, health, transportation, and other services. The lack of both kinds of capital in the Region is a serious barrier.

Lack of Supporting Services. Limited economic activity and services are serious barriers that tend to discourage industrial and manufacturing development in the Region. Such services as the availability of power, transportation facilities, water, housing, and educational facilities are factors that many industrial firms consider of primary importance in site selection. Of equal importance may be the existence of profitable and dependable business firms that can be used on a subcontracting basis to supply various manufacturing components. In the Region, when one gets outside Pueblo and El Paso Counties, there is little in the way of technical or professional skills. Throughout the Region there is a limited supply of personnel with managerial ability of the type and in the quantity that would support even small increases in manufacturing employment. This means that a large proportion of the labor force required by any new industry would have to be imported or would in-migrate.

The Problem of Relative Location. Long distances from major markets as well as between points within the Region are substantial barriers to economic development. The export firms in the Region were all vocal in expressing that distance, both in relationship to markets and access to materials, supplies, and services created difficulties. The problem of coordinating orders from long distances to get the needed quantity and quality plus the inconvenience of waiting were common complaints. Firms on the western slope were particularly vocal about freight rates being a major barrier, which reflects their relative location problem and distance factor. The reluctance of industry to locate in the Region is partially attributed to the excessive distance of the area from the major markets of the country.

Distances within the Region also create development problems. At the present time it is quicker and easier to travel from Denver to New York than it is to go from Eads, Colorado, to Farmington, New Mexico. The mountains in the western part of the Region increase travel time and the expense of doing business. Distances and topography have also created difficulties in public-health programs, adult-education programs, and social-services programs. The demand and need for such programs is apparent, but the per-capita cost of maintaining them outside of the major urban centers is extremely high.

Availability of Industrial Buildings. One of the Region's barriers that could be overcome relatively quickly if proper action were taken is the absence of existing industrial buildings. This factor was the most mentioned major barrier among firms interviewed. Area development personnel throughout Colorado have also emphasized the shortage of usable industrial buildings. Several of the firms interviewed indicated that the lack of available buildings coupled with the lack of

financing had prevented them from expanding in their present locations. There are many small firms that do not have the resources to build their own building or the time and know-how to find someone willing to build it and lease it back to them.

Local Community Attitudes and Leadership. In much of the Region both community attitudes and lack of leadership serve as barriers to development. An attitude prevalent among many of the firms interviewed was that they had located in the community because there was little manufacturing, an ample supply of labor, a lack of competition for this labor force, low wages, a slower pace, and less-intensive competition. They indicated they did not want this to change and would frown on new industry coming in and disturbing their present relationships. There are obviously exceptions; however, most towns do not have the tax base, the funds, or the know-how to promote industrial development.

Lack of Cultural and Urban Amenities. Unless a person lives in or near one of the largest urban centers in the Four Corners Region, there is little likelihood that he will have the opportunity to hear a symphony, attend the theatre, see an opera, visit art exhibits, view a professional sports event, or draw upon the resources of a well-stocked library. The arts are poorly developed in the Four Corners Region, and unfortunately the cost of culture tends to be prohibitive. Locational decisions are usually made on the basis of economic factors; however, when the economics of alternatives is nearly equal, noneconomic factors assume a crucial role.

Transportation. A discussion of transportation is in order because it is frequently cited as a barrier. No respondents viewed highways as a major barrier, and only a small number viewed rail and air access as a problem. The major complaints regarding air service are the infrequent scheduling of flights and the inconvenient hours of service.

New Mexico

As the boundaries are presently drawn, Albuquerque is the only Standard Metropolitan Statistical Area (SMSA) in the New Mexico portion of the Four Corners Region. With an estimated mid-1969 population of 325,000, Bernalillo County, in which Albuquerque is located, contains approximately one-third of the State's total population. Santa Fe, with a population approaching 50,000, is the second largest New Mexico city in the Region. Since the setting and character of the typical communities within the Four Corners Region in New Mexico are definitely rural, small town, and isolated, major emphasis in the following discussion is on barriers to the development of communities of that type.

Image of New Mexico. A study by Marplan of recreation and tourism in New Mexico details the image of the State held by nonresidents.* The image uncovered by Marplan is held both by persons who have visited the State as well as by those who have not. New Mexico is regarded as a desert state having a hot, dry climate, sparse population, little green vegetation, and few attractions. It is seen as a relic of the past, unchanging, primitive, and not possessing an urban, industrial culture. Lastly, the image includes a foreign flavor, arising from an awareness of the Indian and Spanish elements in the State. The study observes that this image appeals to a limited group of visitors with a small-town outlook, a stoic approach to life, unsophisticated, and oriented toward family. Visitors to whom this image does not appeal, on the other hand, are said to be more sophisticated, cosmopolitan, and worldly. They are repelled by the simplicity of the State, by the distances one must drive to see its attractions, by the lack of life. Compared with New Mexico, Colorado was thought to be greener and more spectacular and Arizona to possess milder winters, better accommodations, and tourist resort facilities.

Public Land Barriers. New Mexico's 77.7 million acres (approximate) are 44 percent privately owned, 34 percent federally owned, 13 percent state owned, and 9 percent Indian Lands. The publicly held land, whether federal or state, is often said to present barriers to the development of the State. It is said that if such lands were privately held, the resources they contain would be exploited more intensively, with the consequent addition of payrolls and employment in the private sector and more tax revenues for the state government. It is further added that the federal land, when it is

*Marplan (Division of Communications Affiliates, Inc.), "Recreation and Tourism in New Mexico", in State Planning Office Summary Reports on New Mexico's Resources, Phase I, Santa Fe, 1966, p 103 ff.

leased, or when mineral, timber, or other concessions are made to private interests, generates a revenue that accrues to the Federal Government; whereas if these lands were state owned, then it would be the state that earns the incomes from them. In sum and on balance, there is some truth to the view that altered policies regarding public-land management would speed up the short-term development of the State. One BLM source put it this way: "If we take off some of the controls there would be an immediate upsurge in development, but what do you do 50 years from now when all the resources are used up and the land is stripped bare?"

A more pressing land problem that acts as a barrier to development lies in the land title issue in northern New Mexico. It is common knowledge that land-title claims are chaotic in northern New Mexico. Spanish tradition was that a land holding be divided equally among all heirs. Over succeeding generations, such a practice results in fragmentation of holdings, with the result that land being farmed is often of too small an area to provide a decent living for the farm family. The economic impact of the present title situation is that any prospective land buyer must involve himself with the possibly heavy costs of a lengthy title search, which depresses land values, to the detriment of the seller.

Community Attitudes and Labor-Force Characteristics. Until 1912 when statehood was granted to New Mexico, the traditional, Spanish-language community in the State was largely a self-sufficient rural village, often relying on barter transactions among neighbors for their few exchanges. These communities existed in isolation for the most part. Then the "Anglo" came into this community, and whatever his role, the traditional community tended to regard him with some mistrust. This old attitude survives to this day in some of the Spanish-American communities. The Anglo enters the community as a resort owner, as the owner of a cabin in the mountains, as a motel operator, or as a tourist. In these various guises, he is the employer more frequently than the employee, and the creditor more often than the debtor. Rightly or wrongly, Spanish-surname individuals tend to regard him with some suspicion.

All too many Anglos reacted to contact with Spanish-American communities by imposing upon them the typical stereotype that the dominant culture has been prone to put on all minority groups in the United States. That is to say, the Spanish-American was thought to be stupid, lazy, dirty, and generally of inferior status.

Evidence indicates that in northern New Mexico cultural experiences, minority group status, language differences, rural conditions, and poverty have joined hands in impairing the capacities of a broad section of the work force. A sample of Rio Arriba job applicants showed a marked divergence in performance, falling below national norms in: (1) general learning ability, (2) the ability to understand meanings of words and ideas, and (3) the ability to perform arithmetic calculations quickly and accurately.

Another barrier to development that affects many communities and also the quality of the labor force is the educational problem. The changing contours of the national economy indicate that education will be increasingly important in the years ahead. At the present, New Mexico is retarded in her advance by having inadequate educational levels throughout a broad spectrum of the population. The problems are particularly acute in precisely those areas of the State where poverty is the most pressing. Moreover, too high a proportion of the State's work force is unskilled or only semiskilled.

Financial Barriers to Growth. The issue must frankly be faced that some economic activities located in small rural towns are high risk in the sense that the likelihood of failure is greater than at other possible locations. Hence it becomes difficult to obtain financing for these high-risk activities. A spokesman from the Small Business Administration claims that the agency would be extremely reluctant to underwrite the risks for the movement of smaller manufacturing plants into communities such as those found in northern New Mexico.

Many small communities are unincorporated, and are unable to incur bonded indebtedness for any purpose whatsoever. The private banking community in the State is willing to support low-risk ventures in the rural areas of the State, but are severely limited by law in the kinds of collateral they may hold.

Transportation Barriers: Infrastructure and Service. Transportation for New Mexico, both inter- and intrastate, is characterized by great distances to be covered and a lack of centers generating sizable traffic volumes. Consequently the costs per unit of service are high.

Highways and Trucking. As of December, 1968, New Mexico had a total road mileage of 66,450 miles, of which 11,990 miles, or approximately 18 percent, were paved. Over 37,000 miles or roads, better than half, were primitive and unimproved. Much of the State's road mileage is through mountainous terrain where construction and maintenance costs are high. Even though Federal monies finance a great deal of road construction in New Mexico, the State Highway Engineer is unable to complete approximately 35 percent of the needed road work each year. Another infrastructure barrier lies in the lack of a through route in the northern part of the State.

One of the more serious transportation barriers lies in the fact that small urban communities in New Mexico, far from major urban centers with restricted local markets, and generating low volumes of traffic do not receive frequent regularly scheduled stops by motor or rail carriers. Rail service often does not exist, and motor carriers offer infrequent service. As a result, the shipping of both inbound and outbound freight is characterized by irregularity and uncertainty.

Railroads. Five railroads with some 2,500 miles of right of way serve the State: the Santa Fe, the Southern Pacific, the Rock Island, the Colorado and Southern, and the Denver and Rio Grande Western. Only the Santa Fe and Southern Pacific Railroads make a major contribution to the overall transportation system of the State. The other three serve the northeast and southest corners of the State.

New Mexico has traditionally been split in half by the rate territory boundaries set up by the various "Rate Bureaus" of the transportation industry. There has been an artificial rate-structure gradient, causing different rates to be applied to goods moving across the State from east to west. Thus, goods moving on an east-west axis meet an artificial barrier. It has sometimes been more economical to transship cargo from rail to motor carrier when taking it across the rate line. Especially for cargos shipped intrastate, the result has been needless and artificial delay.

Air Service. Twelve urban centers in New Mexico are served by regularly scheduled airlines, and the real problems with air service are outside the immediate Albuquerque area. The low volume of demand for local carrier capacity restricts the service that can be offered in communities other than Albuquerque by small air carriers. Small air carriers have small fleets of planes to meet the low demand. Infrequent flight scheduling results in even less demand for air service as shippers seek other means. The nature of airport facilities at many smaller communities limits service capabilities and the carrier itself normally does not have adequate staffing in the smaller airports. Some of the smaller planes of the fleet may even have lift capability problems for certain types of cargo.*

The Present Mix of Economic Activities. Consideration of the major economic activities in New Mexico, particularly of those creating sales outside the State ("export" sales), reveals that such activities do not create high "forward and backward linkages" within the State. The major dollar earners bringing in outside money include raw materials or primary products which are passed along after little or no further processing or fabrication. In agriculture, for example, cattle sales are the single largest dollar earner, yet cattle raising does not require large amounts of labor or supplier services.

Of those linkages that do exist, all too many create low-skill, low-wage jobs. Tourism, for example, is an activity that receives a high level of support within the State on the grounds that tourists bring in outside money the expenditure of which stimulates jobs and income. As the flow of tourists increases, so also does the number of motels, gasoline stations, and restaurants. Demand therefore increases for maids to make beds and clean motel rooms, for men at the gas pumps, and for waitresses, bus boys, and dishwashers. These are low-skill, low-wage, and seasonal jobs.

Utah

The description of these barriers to growth is based upon the detailed survey of 26 firms undertaken in April and May, 1970, and continuing research by the Bureau of Economic and Business Research, University of Utah.

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*Information provided by the Albuquerque Transportation Bureau.

Supply of Skilled Labor. The most critical barrier to industrial growth in the Utah portion of the Region as a whole is the lack of skilled workers of all types. This shortage is particularly acute outside of Utah County. In Utah County the lack of skilled workers would represent only a minor barrier. The existence of several large firms, i.e., U.S. Steel, Signetics, and American Refractories, has established a large labor pool with many skilled workers. Utah County also has a technical college which has been successful in providing many skilled workers for its industry.

In areas outside of Utah County the supply of skilled labor is limited in many occupations. This requires that many jobs requiring skilled workers be filled by persons from outside the area. Since few firms now operating in the area require highly skilled workers, it appears common for skilled workers to leave the area immediately when present jobs terminate. Most firms have only one or two jobs that require a person with skills that cannot be easily learned on the job. However, these jobs are usually very important to the successful operation of the firm. In several firms, the managers possessed these skills, but they would rather have another person perform those functions so they could better manage the other aspects of the operation.

Availability of Existing Industrial Buildings. In most communities there are no industrial buildings available. Several firms which were interviewed operated in old theaters, dance halls, and churches. The fact that a building of suitable size was available was often the reason for locating in the smaller communities. This was particularly true with the apparel firms. The availability of local financing often precludes firms from constructing their own buildings. Communities that have realized the necessity for providing a building in order to attract industry have specifically renovated old structures to suit a prospective firm.

In Utah County this is also a problem – not so much that buildings are unavailable but that the rent charged for their use prevents small businesses from using them. One manufacturer said that he had to look for months to find a warehouse, and when finally located, it proved to be less costly to pay transportation to and from Salt Lake City than to rent the local warehouse.

Availability of Financing. The availability of financing is a major barrier to small firms in the Utah portion of the Region. Manufacturers expressed concern over the problems of obtaining loans from local banks. The local banks are geared to service agriculture and mining operations. The conservatism of most of the banks is understandable where manufacturing is such a relatively new sector of these communities. The banks are not used to making the lower interest rate loans to firms for plant and equipment. The financing of accounts receivable is also a relatively new practice to many of the banks, and the nature of much of the manufacturing is such that orders are often cancelled. Small businesses who have established a line of credit with a bank in the area complain that they are at a disadvantage because their competitors in some urban areas are able to receive a much larger line of credit.

Availability of Housing. The quality and cost of available housing is a major barrier in all areas except Utah County – the only area which has had a significant increase in housing. For the remainder of the Utah portion of the Region, housing conditions have deteriorated since 1965. In that year, 338 new dwelling units were constructed. In 1967, only 228 or 100 less new dwelling units were constructed. This decline in new housing is typical of the current "tight money" conditions. The availability of housing was one reason given for the difficulty in attracting skilled labor into the area. Several firms indicated that the available housing was usually substandard and relatively high cost. Because of this, the firms are either unable to attract skilled labor or must pay them a higher wage to compensate for the housing problems.

Access to Materials. The access to materials was cited by many firms to be one of the major barriers faced, and this problem was fairly uniform throughout the whole area. The number of firms in the area using a given type of product is not large enough to encourage suppliers to come into the area to service these markets. Some firms even complained of the difficulty of getting salesmen to visit the area, and therefore they do not receive the service or technical aid given by suppliers to firms in other areas. Most of the materials used by these firms come from outside the State. Many cited the eastern part of the U.S. as their source of supply. Materials coming from out of State are generally shipped to Salt Lake City first and then delivered to other areas in the State. The main means of transportation for most manufacturers is truck cartage. The current structure of the common carrier service and the low demand for services in the Region have resulted in what the manufacturers consider too infrequent service. It is often necessary to use more than one carrier to

transport goods from Salt Lake City. This process adds a minimum of an extra day in shipping time for most materials supplied from outside of the State.

Supply of Trainable Labor. Although the Utah portion of the Region has a persistent labor surplus, the supply of trainable labor is a barrier to industrial growth in many areas. The problem is the greatest in the small communities. A firm will quickly exhaust the labor supply for a specific type of worker. The apparel industry is especially typical. The availability of women in an area is limited and the low pay combined with the image of the job excludes the male component of the labor force. The Indians on the reservations represent a large segment of the unemployed in the Four Corners area of Utah. Of the estimated 4,500 Navajos, between 2,500 and 2,800 are on welfare. Approximately 450 of these are in the unemployed work force, representing 60 percent rate of unemployment. These people, however, are not an available source of trainable labor, as 9 to 12 years of training is necessary before they can function in a white, middle-class society.

Local Community Attitudes. The variation in community attitudes is almost as great as the number of communities. The desire for industrial growth exists in most communities; however, their actions often do not reflect these desires. Community leaders are often unskilled in dealing with industry. One manufacturer reported that the city had purchased the building he rented and gave him 2 weeks notice to vacate. Also, the established power structure of the community is oftentimes fearful of the influx of new people and especially the more progressive and generally younger business types. Lastly, communities associate industry with largeness and do not recognize the importance or benefit of smaller firms.

Availability of Supporting Services. Outside Utah County, most manufacturing firms do not have access to supporting services. In the communities where services are available, the manufacturers were critical of the lack of dependability and quality of the services. This lack of supporting services requires that the firm maintain its own repair personnel and inventory of replacement parts. In several firms interviewed, the repairman was the highest skilled position, and consequently the most difficult to fill.

Access to Markets. The problems with market access were basically those inherent in trying to service distant markets. Most manufacturers were concerned with the delay in delivery of shipments caused by the need to use several different carriers and/or modes of transportation. Utah's location is advantageous to service west-coast markets. However, several firms were primarily engaged in producing goods for the eastern market. These firms felt that access to markets was a problem, but admitted that the lower labor cost allowed them to compete effectively in that market. The independent firms generally felt more disadvantaged in terms of access to markets than the branch plants.

Air Access. The majority of the Utah portion of the Region is, in effect, without air service, with only three cities serviced by an interstate carrier. The three fixed-base carriers which service eight other cities in the area have one flight each day except Saturday and Sunday to each of these cities. Their service is beneficial to the communities, but does not offer enough versatility to be a great benefit to business. The greatest problem with air access is in the movement of people. It is extremely costly in terms of the time involved to reach an airport or to make a trip via one of the fixed-base carriers.

Minor Barriers. Unions, cost of labor, expenses of site development, local taxes, rail access, highway access, and quality of schools are not considered by the manufacturers in the Region to be a deterrent to industrial development. Several of the factors, i.e., quality of schools, unions, and cost of labor, are advantages to industrial development. The remainder, though not advantages, do not discourage development.

CHAPTER 4. IDENTIFICATION OF INDUSTRIES BEST SUITED FOR THE FOUR CORNERS REGION

INTRODUCTION

The major output of this research program is the identification by 4-digit SIC's of industries suitable for potential development in the Four Corners Subregions. This development may take two forms. First, there are industries that may be attracted to the Region because of its advantages, given the activity's mix of factoral inputs and markets. Second, many of these industries could be developed in the Region by local entrepreneurs. This latter approach would be feasible because of the demands generated by markets on the periphery of the Region and in the southwest in general.

The research was conducted primarily within the context of candidate industries considered (1) *desirable,* i.e., those that were most compatible with the goals and objectives of the Commission (e.g., attraction of high-wage, labor-intensive industries); (2) *feasible,* i.e., those that are most closely related to the economy of the Region (e.g., those that demonstrate definite supply or industrial linkages to the Region).

A screening-matrix technique was employed to identify the group of "desirable" industries. Whether or not an industry within the final, desirable group of industries was indeed "feasible" for potential development in a subregion was determined through the use of Battelle's regional/industrial allocation model. The steps taken in the identification of industries best suited for the Region are shown graphically in Figure 7. The final industries were then grouped according to subregions.

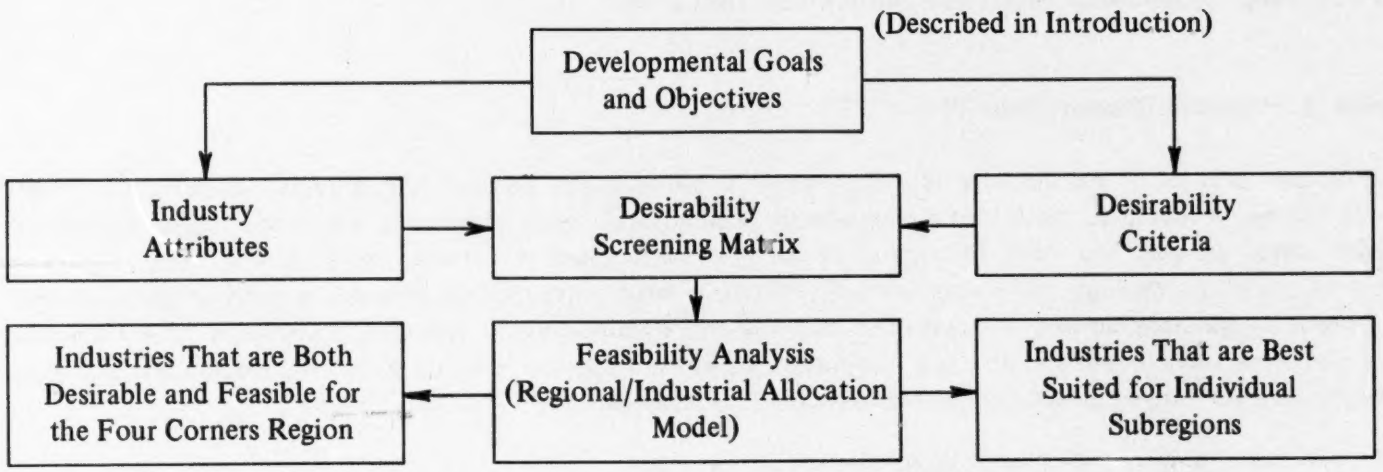
(Described in Introduction)
Developmental Goals and Objectives
Industry Attributes
Desirability Screening Matrix
Desirability Criteria
Industries That are Both Desirable and Feasible for the Four Corners Region
Feasibility Analysis (Regional/Industrial Allocation Model)
Industries That are Best Suited for Individual Subregions

FIGURE 7. STEPS IN THE FOUR CORNERS SUITABLE-INDUSTRIES IDENTIFICATION PROCESS

DESIRABILITY SCREENING MATRIX

The 11 criteria selected for use in the screening matrix are listed below.

- Short term growth rates
- Projected growth rates
- Level of labor intensity
- Wages
- Skill level of labor required
- Size of establishments (low mean)

- Size of establishments (high mean)
- Location of industrial establishments
- Forward industrial linkages
- Backward industrial linkages
- Degree of presence in Region.

The initial use of these criteria involved their application to all 413 manufacturing activities in order to identify the "most desirable" candidates for development. For each criterion, such as short-term growth, all industries were arrayed from highest to lowest according to the trends or characteristics associated with that activity.

Criterion 1. Short-Term Growth Rates

This criterion measures recent actual growth in employment by comparing percent change in average annual employment between 1962 and 1967.* It was selected for inclusion because it identifies growth of "propulsive" industries that, e.g., through industrial linkage effects, can have potentially significant ramifications on the Subregional industrial structures. This is important because growth industries are those most likely to locate new plants in new regions, and where demand exists to facilitate the development of industries locally by persons already within the Region. If an industry is declining, in most cases it is a poor choice of a target for industry-acquisition programs or for local development. The five categories which determined an industry's rank on this criterion are:

5 = Very high growth: annual average employment showed a 30.00 percent gain or better from 1962 to 1967

4 = High growth: a gain between 20.00 to 29.99 percent

3 = Moderate growth: a gain ranging from 10.00 to 19.99 percent

2 = Low growth: annual average employment changed only 0 to 9.99 percent

1 = Declining: annual average employment declined from 1962 to 1967.

Criterion 2. Projected Growth Rates 1960-1975

Projected growth of an industry is a key factor in this analysis because high-growth industries are those that will have the highest potential to move into a new area or expand facilities at an existing site in the future. Rather than utilize historical data, as was the case for the short-term growth rates, Battelle's projections of the U.S. economy by input-output analysis through 1975 was utilized. Battelle's input-output tables describe growth in terms of the value of total output in constant dollars. It is expected that the entire economy will average a growth rate of 4.7 percent per year during the years 1960 to 1975. Therefore, the industries in the screening analyses were assigned to each of five categories, depending on their rate of growth compared with the U.S. average rate.** The categories are:

5 = Very high growth: a growth rate greater than 6.50 percent a year

4 = High growth: 5.50 percent to 6.49 percent a year

3 = Moderate growth: 4.50 percent to 5.49 percent a year

2 = Low growth: 2.50 percent to 4.49 percent a year

1 = Very low growth: less than 2.49 percent a year.

Criterion 3. Level of Labor Intensity

Given the goal of creating new jobs in the Four Corners Region, one of the desirable attributes for industrial development is that it be labor-intensive. This variable is measured by value added per employee*** and serves to

*_Employment and Earnings Statistics for the United States,_ 1909-68, Bulletin No. 1312-6, United States Department of Labor, Bureau of Labor Statistics, August, 1968.

**It is important to note that historical data based upon the decade of the 1960's is heavily biased because of the influence of the Vietnam War. The projections for growth industries enable new developmental opportunities to be revealed by the analysis, as well as bring the 1960 trends into proper perspective.

***Calculated for individual industries from the _1963 Census of Manufacturers_ (Industry Statistics), U.S. Department of Commerce.

differentiate from capital-intensive industries. Thus, for two firms producing the same dollar output, the labor-intensive firm, which uses more employees than the capital-intensive firm, was considered much more desirable for the Region, and is weighted accordingly. The weighting of the five groups is as follows:

5 = Highly labor-intensive: $7,499 dollars of value added per employee

4 = Moderately labor-intensive: between $7,500 and $9,999 of value added per employee

3 = A somewhat even mix between labor and capital: between $10,000 and $11,999

2 = Moderately capital-intensive: between $12,000 and $19,999

1 = Highly capital-intensive: over $20,000 value added per employee.

Criterion 4. Wages

The fourth screening criterion relates to wage levels, being defined as 1967 average weekly wage.* The inclusion of this variable is considered important since the ability to induce migration into the area, and prevent out-migration, is a function of the availability of higher paying jobs, especially among younger people. Further, the need to "close the income gap" between the Region and other parts of the United States is one of the major goals of the Commission's development program. By attempting to identify higher paying employment opportunities for the Region, not only will population remain in, and be attracted to, the Region, but the overall "quality of life" in that area will be raised significantly. To identify those industries characterized by higher wage levels, industries were weighted as follows:

5 = Very high wages: over $140 per week

4 = High wages: $110 to $139 per week

3 = Moderate wages: $90 to $109 per week

2 = Low wages: $70 to $89 per week

1 = Very low wages: under $69 per week.

Criterion 5. Skill of Labor Required

Given the stated goals and objectives of the Commission, it was thought that a "desirable" industry for the Four Corners Region would have, as one of its characteristics, a high percentage of blue-collar employees (blue collar here referring to those employed in the craftsmen, operatives, and laborers occupational groups). Future benefits that could be achieved from providing jobs for workers of this type include reduction of unemployment, higher labor-force-participation rates and higher incomes. The percent of blue-collar workers employed by each industry** was the measure used. The higher the percent, the higher the score an industry received on this criterion. The categories used in ranking are as follows:

5 = Very high percent blue collar: over 80 percent

4 = High: between 75 and 79 percent

3 = Moderate: between 60 and 74 percent

2 = Low: between 50 and 59 percent

1 = Very low: under 49 percent.

Criteria 6 and 7. Size of Establishment

One of the characteristics of the Four Corners Region is the preponderance of small, rural towns virtually devoid of most types of industry. Thus, one objective of an industrial-development program should be the attraction of some kind of industry into otherwise virgin territory. The ability of industry to locate in small towns is, in part, a function of firm size. Many firms that do not require a domestic market, or are insensitive to transportation costs, have as their major locational requirement a trained or trainable labor force. Given the footloose nature of these types of industries, they can be viewed as prime targets for locating in a particular subregion (assuming that adequate service facilities, amenities, etc., are present).

*_Employment and Earnings Statistics for the U.S._, 1909-68, Bulletin No. 1312-6, U.S. Department of Labor, Bureau of Labor Statistics, August, 1968.

**_1960 Census of Population_, U.S. Department of Commerce.

In order to incorporate this size dimension into the screening procedure, two criteria were used, low mean size of establishment, and high mean size of establishment.* For a given industry, all establishments were arrayed by size on a spectrum. An average was taken of the bottom 50 percent, and this number was called the low mean size. The same procedure was followed to obtain the high-mean-size figure for each 4-digit SIC industry. This procedure was followed because the distribution of plant sizes is essentially bimodal, and industry averages are very misleading. For each criterion, the smaller the number of employees per establishment, the higher the ranking received, but the number of firms falling into a given category was varied so that this criterion provides guidance, but not unrealistic constraints.

The five groups for low mean size are:

5 = 1 to 7 employees
4 = 8 to 15 employees
3 = 16 to 25 employees
2 = 26 to 69 employees
1 = 70 to 1760 employees**.

For high mean size establishment, the five division are:

5 = 1 to 99 employees
4 = 100 to 199 employees
3 = 200 to 399 employees
2 = 400 to 599 employees
1 = 600 to 6544 employees

Criterion 8. Location of Industrial Establishments — Urban Orientation

This variable is utilized in the screening to assess the degree to which given industries are urban-oriented. Specifically, it measures the percentage of establishments by given industries located in urban areas.*** This is an important consideration in the Four Corners Region where there are relatively few urban areas. Accordingly, those industries that have the lowest percentage of establishments in urban centers were assigned th highest rank. This criterion helps to place in a more realistic perspective industries that are often closely linked to other highly urban activities (such as typesetting) or those whose products are extremely customer- or distance-sensitive (such as soft drink bottling).

The assignment rules according to share of an industry concentrated in urban areas is as follows:

5 = 0 to 69 percent urban
4 = 70 to 79 percent urban
3 = 80 to 85 percent urban
2 = 86 to 90 percent urban
1 = 91 to 100 percent urban

Note: The determination of desirability for the Region was based primarily upon the first eight criteria, the three described below were used primarily to provide additional insight.

Criteria 9 and 10. Forward and Backward Linkages

These criteria were included in the screening process to assess the locational importance of industries being linked to either suppliers or markets within the Four Corners Region. Individual industries received scores in the matrix reflecting the degree to which they have either *forward linkages* with existing industries in the Region (i.e., where an industry that does not by its nature cater exclusively to final demands will induce attempts to utilize its outputs as inputs in other industries), or *backward linkages* (i.e., where every nonprimary industry will induce attempts to supply through domestic production the inputs needed in that industry).

Input-output tables based upon generalized industry structures were used for identification of linkages. Initially, the linkage analysis was based upon the most important activities now found in the four-state area and the Region. The activities purchasing from these industries were then identified (forward linkages), or were the industries which supply

*1963 *Census of Manufactures* (Industry Statistics), U.S. Department of Commerce.
**Very few industries exceeded 200 employees.
***Census of Manufactures,* U.S. Department of Commerce.

these major activities (backward linkages).* This pattern of linkages is however based on interactions between different types of industries and not specific firms. For example, this analysis identifies that certain types of containers are linked to food processing, but specific interfirm relationships cannot be described. Similarly, while many of these linkages involve firms in the four-state area, it is not possible to precisely indicate the extent to which supplies and demands are actually located in the study area. This study identifies that a linkage exists, but to describe exactly the nature of these relationships would entail surveying literally hundreds of firms and requesting information that is business sensitive and difficult to pull together.

In order to evaluate the relationship between the four-state area and the external economic world, the same process was repeated for industries not now important in terms of employment in the study area. In this perspective, a backward linkage was identified where an external industry had supply connections to an activity found in the study area; and forward linkages are seen to exist when an activity in one of the states served external markets.

Six categories were constructed to rank the candidate industries (applied to both forward and backward linkages):

5 = ⩾9 existing linkages
4 = 7-8 existing linkages
3 = 5-6 existing linkages
2 = 3-4 existing linkages
1 = 1-2 existing linkages
0 = 0 existing linkages

Criterion 11. Degree of Presence in Region

This last criterion was designed to take into account existing industrial demand in the Four Corners Region. By identifying to what extent industry types are currently represented in the area, actual and potential linkages can be further examined as they relate to economic development efforts. Conversely, those industries least represented in the Region can be interpreted as "targets", especially when linkage analysis suggests that they are definitely needed. The number of employees in each 4-digit SIC industry in the Region** was used as a surrogate to demonstrate this relationship.

The five categories for ranking are:

5 = 0-249 employees
4 = 250-499 employees
3 = 500-749 employees
2 = 750-999 employees
1 = 1000 and over.

Criteria Weighting Procedure

On the basis of the above criteria, each of the 413 candidate industries was screened to identify those considered most desirable for the Four Corners Region. The screening matrix identifies those industries with the largest number of favorable characteristics as being most desirable. In order to provide a means for arraying the candidate industries in a way reflective of the most important goals and objectives as stated by the Commission, different weights were assigned to the criteria. These are identified in Table 21.

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*These linkages were based upon input-output relationships taken from the *1963 Census of Manufactures* by the Office of Business Economics, Department of Commerce.

***1963 Census of Manufactures* (Industry Statistics).

TABLE 21. WEIGHTS ASSIGNED TO SCREENING CRITERIA IN DESIRABILITY MATRIX

Characteristic	Weight
Short-term growth	5
Projected growth rate	10
Labor intensity	10
Wages	5
Blue collar	10
Small size of establishment (low mean)	5
Small size of establishment (high mean)	5
Small percent urban	5
Forward linkage	5
Backward linkage	5
Demand in Region	10

Description and Use of the Desirability Screening Matrix

All 413 manufacturing industries (SIC's), their scores on the 11 industry criteria, and the weightings given a criterion were all combined in 413 x 13 matrix which also allowed for subtotals and final totals. The 4-digit SIC numbers for the industries were arranged vertically, in numerical sequence (SIC group 20 through group 39), and the screening criteria were also assigned specific columns (see Table 22 which includes a portion of the matrix). Each of the 413 candidate industries evaluated was then scored for each criterion, so that reading across a row indicates how an industry scored on all 11 factors.

Two total scores were used in the screening process. First, a subtotal of the first eight criteria was calculated by multiplying the score obtained by an industry on each factor by the "weight" given that consideration and then adding all eight values. This basic indicator of desirability was used as the primary screening factor in arriving at the industries that were selected for more detailed examination. Criteria 9, 10, and 11 were then examined in the same manner; i.e., by multiplying scores by criteria weight and summing. These latter results were used primarily to place the "desirable" industries in a realistic perspective.

On the basis of the two sets of scores, the most desirable activities for development in the Four Corners Region were then identified for the feasibility analysis. A final list of 100 industries was used as input to the regional/industrial allocation model. It should be noted that the 100 industries are counted in terms of Office of Business Economics input-output industry codes. Quite frequently, one of these codes encompasses more than one SIC-coded industry.

REGIONAL/INDUSTRIAL ALLOCATION MODEL

One way in which the results of the desirability screening can be utilized is through the identification of a subregion's industrial potential. Potential is here defined by matching up a subregion's resources with specific industry requirements and identifying candidate prospects chosen from the list of desirable industries. The goal here is to identify which of the desirable industries are most feasible for development. To accomplish this, a regional/industrial allocation model has been developed which simplifies the process of identifying industrial potential.

Most previous models of industrial location have sought to identify optimal locations. Most decision makers, however, are concerned with evaluation and selection from a set of satisfactory alternative locations. Rarely is the

TABLE 22. RESULTS OF INITIAL INDUSTRY SCREENING' FOUR CORNERS REGION

(Industries are ranked according to SIC numbers)

	Desirability Screening Matrix:	Growth - Recent	Growth - Future	Labor Intensity	Wages	Blue Collar	Small Size (Low Mean)	Small Size (High Mean)	Small Percent Urban	Desirability Subtotal	Forward Linkage	Backward Linkage	Demand in Region	Total Score
	Criteria Weight:	5	10	10	5	10	5	5	5		5	5	10	
2011	Meat Packing	1	2	3	4	3	4	4	4	165	3	2	1	200
2013	Sausage & Prepared Meats	3	2	2	4	3	5	5	1	160	2	2	5	230
2015	Poultry & Small Game	4	2	5	1	5	4	4	5	210	3	2	1	245
2292	Lace Goods	3	4	5	3	5	5	5	3	235	0	0	5	285
2297	Wool Scouring & Worsted	3	4	4	3	4	5	4	5	220	0	0	5	270
2298	Cordage & Twine	3	4	5	3	3	5	4	5	220	0	0	5	270
2311	Men's Suits, Coats, & Overcoats	2	2	5	2	5	4	3	3	190	2	2	1	220
2321	Men's Shirts, Collars	2	2	5	1	5	4	3	5	195	2	2	5	265
2322	Men's Underwear	4	2	5	1	5	2	3	5	195	2	2	5	265
2323	Men's Neckwear	4	2	5	1	3	5	5	1	180	1	1	5	240
2327	Men's Trousers	4	2	5	1	5	4	3	5	205	2	2	4	265
2328	Men's Work Clothing	1	2	5	1	5	2	3	5	180	2	2	2	220
2329	Men's Clothing NEC	4	2	5	1	5	3	4	5	205	2	2	1	235
2331	Women's Blouses, Shirts	3	2	5	1	5	4	5	3	200	1	1	4	250
2335	Women's Dresses	2	2	5	2	4	3	5	3	185	1	1	4	235
2337	Women's Suits, Skirts & Coats	2	2	5	2	3	4	5	1	170	1	1	5	230
2339	Women's Outerwear NEC	4	2	5	1	3	4	5	3	185	1	1	4	235
2341	Women's Underwear & Nightwear	2	2	5	1	4	4	4	5	190	2	2	1	220
2342	Corsets	2	2	5	1	3	3	4	4	170	1	1	5	230
2351	Millinery	1	2	5	2	4	5	5	1	180	1	1	5	240
2352	Hats and Caps	1	2	5	2	4	5	5	3	190	1	1	5	250
2361	Children's Dresses, Blouses	1	2	5	1	3	3	5	3	165	1	1	5	225
2363	Children's Coats, Suits	2	2	5	1	5	4	5	1	185	1	1	5	245
2369	Children's Outerwear NEC	2	2	5	1	4	4	4	4	185	1	1	5	245
2371	Fur Goods	1	2	3	1	4	5	5	1	155	1	1	5	215
2381	Dress, Work Gloves	3	2	5	1	5	5	4	5	210	1	1	5	270
2384	Robes and Dressing Gowns	3	2	5	1	4	5	5	3	195	1	1	5	255
2385	Raincoats	3	2	5	1	3	4	5	4	185	1	1	5	245
2386	Leather Clothing	3	2	5	1	3	5	5	2	180	1	1	5	240
2387	Apparel Belts	3	2	5	1	3	5	5	2	180	1	1	5	240

TABLE 22. (Continued)

	Desirability Screening Matrix:	Growth - Recent	Growth - Future	Labor Intensity	Wages	Blue Collar	Small Size (Low Mean)	Small Size (High Mean)	Small Percent Urban	Desirability Subtotal	Forward Linkage	Backward Linkage	Demand in Region	Total Score
	Criteria Weight:	5	10	10	5	10	5	5	5		5	5	10	
2389	Apparel Accessories NEC	3	2	5	1	4	5	5	2	190	1	1	4	240
2393	Textile Bags	3	2	5	2	3	4	5	1	175	2	1	5	240
2394	Canvas Products	4	2	5	2	3	5	5	3	195	2	1	5	260
2395	Pleating & Novelty Stitch	4	2	5	2	5	5	5	1	205	2	1	5	270
2396	Automotive Trimmings	3	2	4	2	4	5	5	2	185	2	1	5	250
2397	Schiffli Embroideries	3	2	4	2	5	5	5	1	190	2	1	5	255
2399	Fabricated Textiles NEC	3	2	5	2	3	5	5	2	185	2	1	2	220
2411	Logging Camps Contractors	1	2	5	2	5	5	5	5	210	2	3	3	265
2421	Sawmills, Planing Mills	1	2	5	3	5	5	5	5	215	3	3	1	255
2426	Hardwood Dimension Mills	2	2	5	3	5	5	5	5	220	1	1	5	280
2429	Special Product Sawmills	2	2	5	3	5	5	5	5	220	0	0	5	270
2432	Veneer and Plywood	2	2	4	3	5	3	4	5	195	3	1	5	265
2441	Wooden Boxes	2	1	5	2	4	5	5	5	195	0	0	5	245
2442	Wirebound Boxes	2	1	5	2	5	4	4	5	195	0	0	5	245
2443	Veneer Plywood Containers	1	1	5	2	5	5	5	5	200	0	0	5	250
2445	Cooperage	1	1	5	2	4	5	5	5	190	0	0	5	240
2511	Wood Household Furniture	3	1	5	2	4	5	5	5	200	3	2	4	265
2512	Upholstered Wood Furniture	3	1	5	3	4	5	5	5	205	2	3	2	250
2514	Metal Household Furniture	2	1	4	2	3	5	4	4	165	0	0	5	215
2519	Household Furniture NEC	2	1	5	2	3	5	5	3	175	0	0	5	225
2521	Wood Office Furniture	4	4	4	4	4	5	5	5	235	0	0	5	285
2522	Metal Office Furniture	4	4	3	4	3	4	3	4	195	0	0	5	245
2531	Public Building Furniture	5	4	4	3	3	5	5	5	225	0	0	5	275
2541	Wood Partitions	3	4	4	4	3	5	5	3	210	0	0	5	260
2542	Metal Partitions	3	4	3	4	3	5	5	3	200	0	0	5	250
2591	Venetian Blinds	3	4	4	3	3	5	5	4	210	0	0	5	260
2599	Furniture and Fixture NEC	3	4	4	3	3	5	5	3	205	0	0	5	255
2651	Folding Paperboard Boxes	2	3	4	3	3	5	4	3	185	3	1	5	255
2652	Setup Paperboard Boxes	2	3	5	3	4	3	5	3	200	3	1	5	270
2653	Fiber Boxes	4	3	4	4	3	3	4	3	190	3	1	5	260
2654	Sanitary Food Containers	2	3	2	4	3	2	3	4	155	3	1	5	225
2655	Fiber Cans, Tubes, Drums	5	3	4	4	3	4	5	4	210	3	1	5	280

BATTELLE MEMORIAL INSTITUTE - COLUMBUS LABORATORIES

TABLE 22. (Continued)

	Desirability Screening Matrix:	Growth - Recent	Growth - Future	Labor Intensity	Wages	Blue Collar	Small Size (Low Mean)	Small Size (High Mean)	Small Percent Urban	Desirability Subtotal	Forward Linkage	Backward Linkage	Demand in Region	Total Score
	Criteria Weight:	5	10	10	5	10	5	5	5		5	5	10	
2731	Books Publishing & Printing	4	3	1	4	1	5	5	1	145	1	1	5	205
2732	Book Printing	5	3	4	4	4	5	4	4	220	1	1	5	280
2741	Misc. Publishing	4	3	3	4	1	5	5	1	165	0	1	3	200
2751	Commercial Printing	2	3	4	4	4	5	5	2	200	2	1	1	225
2752	Printing Lithographic	5	3	3	4	3	5	5	1	190	2	1	1	215
2812	Alkalies and Chlorine	2	3	2	5	3	1	1	2	135	1	2	5	200
2813	Industrial Gases	3	4	1	5	2	5	5	2	170	1	2	5	235
2815	Cyclic Intermediates	3	4	1	5	3	4	2	4	170	1	2	5	235
2816	Inorganic Pigments	3	4	1	5	3	5	3	4	180	1	2	5	245
2818	Organic Chemicals NEC	3	4	1	5	3	5	3	4	180	1	2	5	245
2819	Inorganic Chemicals NEC	2	2	1	4	2	5	3	5	145	1	2	5	210
2821	Plastics Materials Resins	3	4	2	4	3	5	3	4	185	3	1	5	255
2831	Biological Products	4	4	3	4	2	5	4	4	195	1	1	5	255
2833	Medicinal Chemicals	4	4	2	4	2	5	4	4	185	1	1	5	245
2861	Gum and Wood Chemicals	1	4	2	4	3	5	5	5	190	2	2	5	260
2871	Fertilizers	3	4	2	3	3	3	4	4	175	0	1	4	220
2872	Fertilizers Mixing Only	3	4	3	3	3	5	5	5	205	0	0	5	255
2891	Adhesives and Gelatin	3	4	2	4	2	5	5	2	175	1	1	5	235
2892	Explosives	5	4	3	4	3	3	2	5	195	1	1	4	245
2893	Printing Ink	3	4	2	4	2	5	5	1	170	1	1	5	230
2895	Carbon Black	3	4	1	4	4	2	4	5	180	1	1	5	240
2899	Chemicals NEC	3	4	2	4	1	5	5	2	165	1	1	1	185
3031	Reclaimed Rubber	3	4	2	3	4	1	3	1	155	4	1	5	230
3069	Rubber Products NEC	3	4	3	3	3	4	3	4	185	2	1	1	210
3131	Footwear Cut Stock	1	2	5	2	5	5	5	5	210	0	0	5	260
3141	Shoes Except Rubber	1	2	5	2	5	1	2	5	175	0	1	5	230
3142	House Slippers	1	2	5	2	3	4	4	5	180	0	1	5	235
3151	Leather Gloves	2	2	5	2	4	4	4	5	195	0	1	5	250
3161	Luggage	4	2	5	2	3	5	4	2	185	2	2	1	215
3171	Handbags and Purses	2	2	5	2	3	4	5	2	175	0	0	5	225
3172	Small Leather Goods	2	2	5	2	3	5	5	3	185	0	0	5	235
3199	Leather Goods NEC	3	2	5	2	3	5	5	1	180	0	0	5	230

TABLE 22. (Continued)

	Desirability Screening Matrix:	Growth - Recent	Growth Future	Labor Intensity	Wages	Blue Collar	Small Size (Low Mean)	Small Size (High Mean)	Small Percent Urban	Desirability Subtotal	Forward Linkage	Backward Linkage	Demand in Region	Total Score
	Criteria Weight:	5	10	10	5	10	5	5	5		5	5	10	
3251	Brick and Structural Tile	1	3	4	3	4	3	5	5	195	0	0	2	215
3253	Ceramic Wall and Floor Tile	1	3	4	3	3	2	3	5	170	0	0	5	220
3259	Structural Clay Products NEC	1	3	4	3	4	3	4	5	190	5	2	4	265
3262	Vit. China Food Utensils	1	3	5	4	3	3	3	5	190	0	0	5	240
3263	Fine Earthenware Food Utensils	1	3	5	4	4	1	1	5	180	0	0	5	230
3264	Porcelain Elect. Supplies	1	3	4	4	3	4	3	4	180	3	2	1	215
3269	Pottery Products NEC	1	3	5	4	3	5	5	5	210	1	0	5	265
3271	Concrete Block and Brick	2	3	3	4	3	5	5	5	195	5	4	5	290
3272	Concrete Products	2	3	3	2	3	5	5	5	185	0	3	1	210
3281	Cut Stone and Stone Products	1	3	5	4	5	5	5	5	230	0	0	5	280
3432	Plumbing Fittings, Brass	2	3	3	4	3	5	4	4	185	0	0	5	235
3442	Metal Doors, Sash, and Trim	2	3	4	3	3	5	5	3	190	1	1	5	250
3444	Sheet Metal Work	5	3	3	4	3	5	5	3	200	4	3	1	245
3446	Architectural Metal Work	4	3	4	4	3	5	5	2	200	0	0	4	240
3451	Screw Machine Products	5	2	4	4	3	5	5	2	195	3	1	5	265
3452	Bolts, Nuts, Rivets, Washers	3	2	2	4	3	3	3	1	140	3	1	5	210
3461	Metal Stamping	4	2	3	4	3	5	4	3	180	4	2	5	260
3471	Plating and Polishing	5	2	4	3	4	5	5	3	205	1	0	5	260
3479	Metal Coating Engraving	5	2	4	3	3	5	5	2	190	0	0	5	240
3481	Fabricated Wire Products	3	2	4	4	3	5	5	3	190	2	1	5	255
3511	Steam Engines and Turbines	2	3	2	5	2	1	1	1	120	0	1	5	175
3519	Internal Combustion Engines	5	3	2	5	3	4	1	5	180	3	3	2	230
3522	Farm Machinery and Equipment	5	2	3	4	3	5	5	4	195	2	3	3	250
3531	Construction Machinery	4	4	2	4	3	5	3	4	190	3	3	3	250
3532	Mining Machinery and Equipment	4	4	1	4	2	5	4	4	175	2	2	1	205
3535	Conveyors	5	3	2	4	2	5	4	4	180	0	0	5	230
3536	Hoists, Cranes, and Monorails	5	3	3	4	3	5	4	4	200	0	1	5	255
3537	Industrial Trucks and Tractors	5	3	2	4	2	5	4	4	180	0	0	5	230
3541	Metal Cutting Mach. Tools	5	4	3	5	2	5	4	3	200	0	1	5	255
3542	Metal Forming Mach. Tools	4	4	2	4	2	5	4	3	180	0	0	5	230
3548	Metal Working Machinery	2	4	2	4	3	5	4	3	180	1	1	5	240
3551	Food Products Machinery	3	4	2	4	2	5	4	4	180	0	1	5	235

TABLE 22. (Continued)

	Desirability Screening Matrix:	Growth - Recent	Growth - Future	Labor Intensity	Wages	Blue Collar	Small Size (Low Mean)	Small Size (High Mean)	Small Percent Urban	Desirability Subtotal	Forward Linkage	Backward Linkage	Demand in Region	Total Score
	Criteria Weight:	5	10	10	5	10	5	5	5		5	5	10	
3552	Textile Machinery	3	4	4	3	3	5	4	5	210	0	0	5	260
3553	Woodworking Machinery	4	4	2	4	3	5	5	4	200	0	0	5	250
3554	Paper Industries Machinery	5	4	3	4	3	5	4	5	215	1	0	5	270
3555	Printing Trades Machinery	3	4	2	4	3	5	4	1	175	0	0	5	225
3559	Special Industry Machines	4	4	3	4	2	5	5	4	200	1	1	5	260
3564	Blowers and Fans	5	3	3	4	2	5	4	2	180	0	0	5	230
3569	General Industry Machines	5	3	3	4	1	5	5	2	175	4	2	1	215
3572	Typewriters	5	5	2	4	3	2	1	5	185	0	0	5	235
3576	Scales & Balances	3	5	3	4	2	5	4	4	200	0	0	5	250
3579	Office Machines NEC	3	5	2	4	2	5	3	1	170	0	0	5	220
3581	Automatic Vending Machine	3	5	3	4	2	5	4	1	185	1	0	5	240
3582	Commercial Laundry Equipment	3	5	3	4	3	5	4	4	210	0	0	4	250
3589	Service Industry Machines	3	5	2	4	2	5	5	2	185	0	0	5	235
3611	Electric Measuring Instrument	3	4	3	3	3	5	4	2	185	4	4	1	235
3629	Electric Industrial Goods	2	4	3	4	3	5	4	4	195	0	0	5	245
3641	Electric Lamps	4	3	2	3	5	3	2	4	180	0	1	5	235
3642	Lighting Fixtures	4	3	3	3	3	5	5	4	195	0	1	5	250
3651	Radio & TV Receiving Sets	5	1	3	3	3	5	2	3	160	4	3	3	225
3674	Semiconductors	5	3	4	3	2	2	1	5	170	4	1	1	205
3679	Electronic Components NEC	5	3	4	3	2	5	4	4	195	4	4	1	245
3694	Engine Electrical Equipment	2	3	2	4	3	5	2	5	170	1	1	5	230
3699	Electrical Products NEC	2	3	4	4	3	5	5	3	195	1	0	5	250
3713	Truck and Bus Bodies	3	3	4	4	3	4	5	5	205	0	1	5	260
3715	Truck Trailers	5	3	3	3	3	5	4	2	185	2	2	1	215
3751	Motorcycles & Bicycles	5	4	4	3	3	5	3	1	195	0	0	5	245
3799	Transportation Equipment NEC	5	4	4	3	3	5	5	5	225	2	2	4	285
3811	Scientific Instruments	3	3	3	4	1	5	4	1	155	5	5	1	215
3821	Mech. Measuring Devices	3	3	3	4	2	5	4	3	175	4	4	2	235
3831	Optical Instruments & Lenses	5	5	3	3	2	5	5	1	195	0	0	5	245
3841	Surgical and Medical Instruments	5	3	3	3	3	5	5	2	190	2	2	4	250
3842	Surgical Appliances and Supplies	5	3	2	3	1	5	5	2	160	1	0	5	215
3851	Ophthalmic Goods	3	5	4	3	3	5	4	4	215	1	0	5	270

TABLE 22. (Continued)

	Desirability Screening Matrix:	Growth - Recent	Growth - Future	Labor Intensity	Wages	Blue Collar	Small Size (Low Mean)	Small Size (High Mean)	Small Percent Urban	Desirability Subtotal	Forward Linkage	Backward Linkage	Demand in Region	Total Score
	Criteria Weight:	5	10	10	5	10	5	5	5		5	5	10	
3911	Jewelry Precious Metal	3	2	4	3	3	5	5	1	175	1	2	1	200
3912	Jewelers Findings & Materials	3	2	5	3	3	5	5	1	185	1	2	5	250
3913	Lapidary Work	3	2	3	3	3	5	5	1	165	1	2	5	230
3914	Silverware and Plated Ware	4	2	4	3	4	5	4	5	205	1	2	5	270
3949	Sporting and Athletic Goods	3	2	4	2	3	5	5	5	190	2	2	3	240
3988	Morticians' Goods	2	2	4	3	3	5	5	4	185	1	0	5	240
3992	Furs Dressed and Dyed	2	2	4	3	5	5	5	2	195	0	0	5	245

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decision focused on optimal alternatives. It is generally agreed that industry-location decisions are twofold in nature. First, a desired region is identified and second, a specific site is selected.* The computer model discussed here is aimed at the first step in this process: the identification of subregions that have a high potential to receive certain industries.

In developing the regional/industrial allocation model, a set of relevant industry-location factors was selected which define what industries seek in a regional location as well as what attributes a subregion must have to attract an industry. Many empirical studies have been undertaken which seek to identify through survey technique or case studies what factors are most important in the location decision.** In most of these studies the traditional factors of marketing, raw materials, transportation, and labor, among others, are frequently mentioned as most important in the regional decision step. Thus, the computer model developed utilizes these factors in assessing an industry's needs and compares them with a subregion's resources. In assessing industry needs, it is important to evaluate both an industry requirement (i.e., the number of employees required for a potential plant) and an industry orientation (i.e., the degree to which the industry is oriented to selling products to the consumer market). Similarly, when evaluating a subregion's resources, it is important to assess the labor force available for potential industries as well as the size of the consumer market nearby.

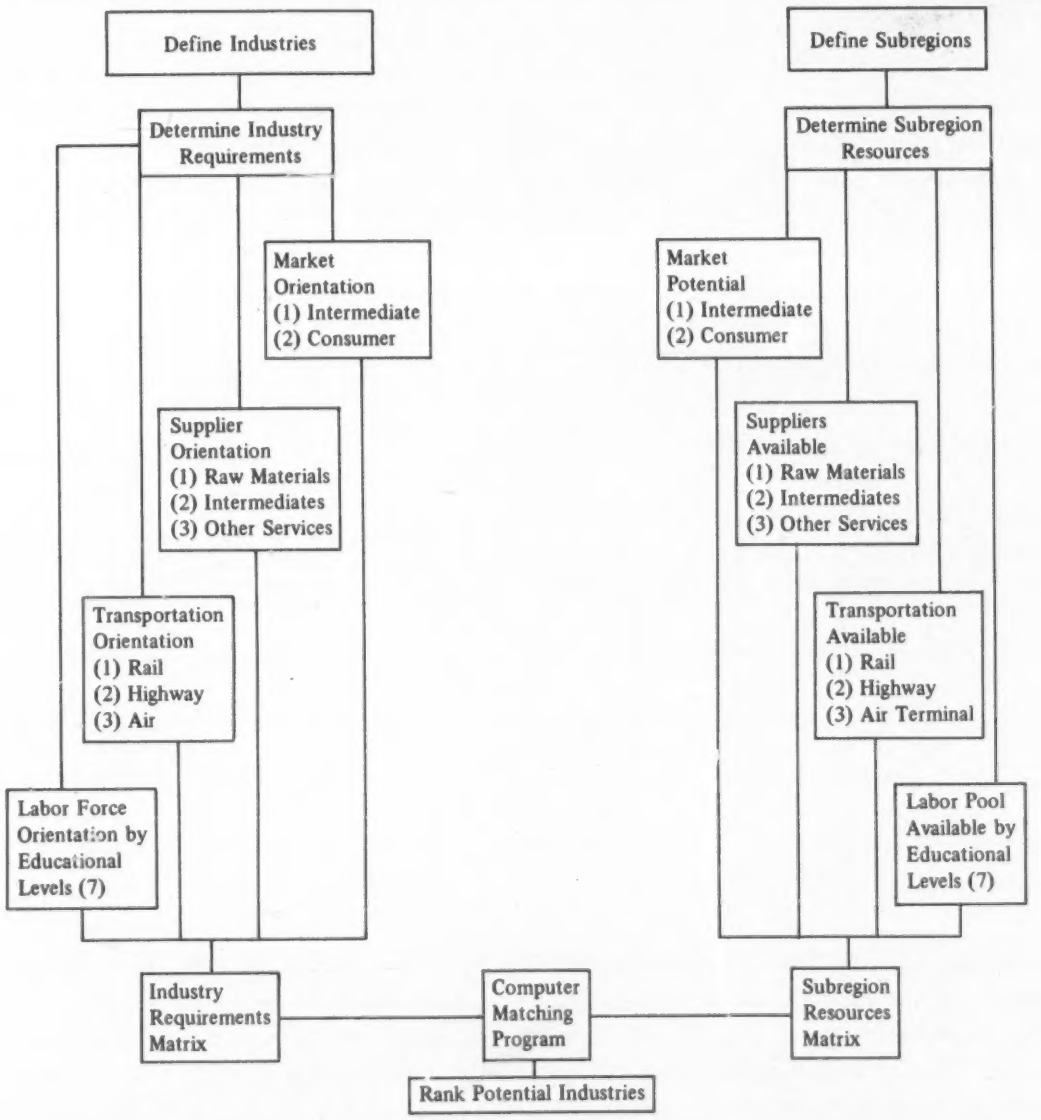
Define Industries
Determine Industry Requirements
Market Orientation (1) Intermediate (2) Consumer
Supplier Orientation (1) Raw Materials (2) Intermediates (3) Other Services
Transportation Orientation (1) Rail (2) Highway (3) Air
Labor Force Orientation by Educational Levels (7)
Define Subregions
Determine Subregion Resources
Market Potential (1) Intermediate (2) Consumer
Suppliers Available (1) Raw Materials (2) Intermediates (3) Other Services
Transportation Available (1) Rail (2) Highway (3) Air Terminal
Labor Pool Available by Educational Levels (7)
Industry Requirements Matrix
Computer Matching Program
Subregion Resources Matrix
Rank Potential Industries

FIGURE 8. REGIONAL/INDUSTRIAL ALLOCATION MODEL

*This concept is discussed in previous articles:

B. H. Stevens and C. A. Brackett, "New and Changing Factors in Industrial Location", *AIDC Journal,* II (3) (1967).

Louis K. Loewenstein, "New Factors and Facets of Industrial Location", *AIDC Journal,* III (3) (1968).

**For a bibliography of a large number of these studies see:

B. H. Stevens and C. A. Brackett, *Industrial Location – A Review and Annotated Bibliography,* Bibliography Series No. 3, Philadelphia Regional Science Research Institute, 1967.

The objective of the regional/industrial allocation model is to rank potential industries for a selected set of subregions. In doing this, four specific locational factors were selected:

(1) Markets
(2) Suppliers
(3) Transportation
(4) Labor force.

These in turn can be subdivided into more detailed categories. Thus, the *markets* considered include intermediate (semifinished goods) and consumer; *suppliers* are defined to include raw materials, intermediates, and other services (i.e., communications, utilities, banking, repair services, etc.); *transportation* modes considered are rail, highway, and air; and finally, the *labor force* is evaluated by educational level. It is assumed that education serves as a surrogate for skill level in the absence of a detailed survey of occupational skills of a region's labor force. (Seven categories of educational attainment are used: 0-7, 8, 9-11, 12, 13-15, 16, 16+ years of education.) Figure 8 summarizes the model. As can be seen, each industry is evaluated on 15 characteristics. These include the industry's orientation to intermediate and consumer markets; the requirements each industry has for raw materials, intermediate or semifinished manufactured products, and other services; the industry's orientation to shipping products by rail, highway, or air; and the requirement of the average plant in each specific industry for workers with various skill levels (educational attainment). In a similar fashion, each of the subregions is evaluated in terms of the intermediate- and consumer-market potential within an accessible radius of the subregion; the suppliers available to a potential plant locating in the subregion, including raw materials, semifinished products and other services; the distance to the nearest interstate highway, rail line, and air terminal from a central point in the subregion; and the available labor force in the subregion by educational level. The measures used for each of these resources include an index of market potential and suppliers, distance (miles) to transportation facilities, and numbers of people available with various educational levels.

These measures can be summarized in a matrix:

Industry Requirements Matrix

Industry \ Factor	1	2	...15
1			
2			
3			
.			
.			

Subregion Resource Matrix

Industry \ Factor	1	2	...15
1			
2			
3			
4			
.			

For example, in defining the industry-requirements matrix, the printing-ink industry (SIC 2893) ships 61 percent of its output to intermediate manufacturing industries and 7 percent to the final consumer market. The supplier requirements or inputs comprise 5 percent raw materials, 47 percent intermediate manufactured products, and 13 percent other services. (In both the market and supplier percentages, certain markets and suppliers are excluded – thus they do not total to 100 percent). In moving products to market, 91 percent are moved by highway, 3 percent by rail, and less than 1 percent by air. A typical large plant employs 45 people with the educational levels of: 5 employees: 0-7 years' education; 5: 8 years; 8: 9-11 years; 14: 12 years (high-school graduates); 5: 13-15 years; 5: 16 years (college graduates); 3: 16+ years.

In defining the subregion resource matrix, each factor is evaluated in terms of the specific industry being considered. For example, there are a possible 291 intermediate manufacturing industries to which the printing-ink industry might sell its output. Using input-output tables* it can be shown that major markets exist in commercial-printing plants, industrial-chemical plants, paper and paperboard mills, and related industries. Market potential for the printing-ink industry is

*U.S. Department of Commerce, *Input-Output Structure of the U.S. Economy,* Vol. I, Washington, D.C., U.S. Government Printing Office (1969).

evaluated by defining the size of markets within varying distances of the subregion being considered. Market size was measured by employees in these various industries within a 200-mile radius of a subregion using a friction coefficient of 1.5. Consumer markets were defined by population in counties within 300 miles of a subregion. A friction coefficient of 2.0 was applied to this measure. Also included in the subregion resource matrix was a measure of the labor-force available for each industry being considered. A distance of 50 miles from a subregion with a friction coefficient of 2.0 was used.

While markets illustrate the concept of forward linkages, suppliers illustrate examples of backward linkages important to all industries. Again using input-output tables, the backward linkages are examined for each industry being evaluated. This includes a possible 19 raw materials, 291 intermediate manufacturing industries, and 35 other services. The presence of the intermediate manufacturing industries was examined within a 100-mile radius of the individual subregions. The raw materials and other service suppliers were considered available if they were within 50 miles of a subregion.

The availability of transportation facilities in the Region is interpreted as the distance in miles from a central point in the subregions to the nearest interstate highway, rail line, and air terminal. The labor force available to support a new industry is defined as the number of people available by skill level – assuming full-employment labor-force participation rates and low unemployment levels *minus* current employment. This results in defining a pool of available labor which can be indexed.

Once the two matrices have been completed, it is then necessary to compare an industry's requirements with their availability in each of the subregions being evaluated. This can be done mathematically by plotting a single point which represents the industry's requirements and points representing each of the subregions. In Figure 9 the point plotted, which represents two industry requirements (a and b), is compared with the availability of a and b in Subregions 1, 2, and 3. In this simplified example, Subregion 2 most nearly satisfies the industry's requirements and would have the highest locational potential in this model's evaluation. This particular example considers only two factors, whereas the regional/industrial allocation model considers the 15 factors mentioned above. Special considerations are taken into account when the subregion's resources exceed the needs of the industry.

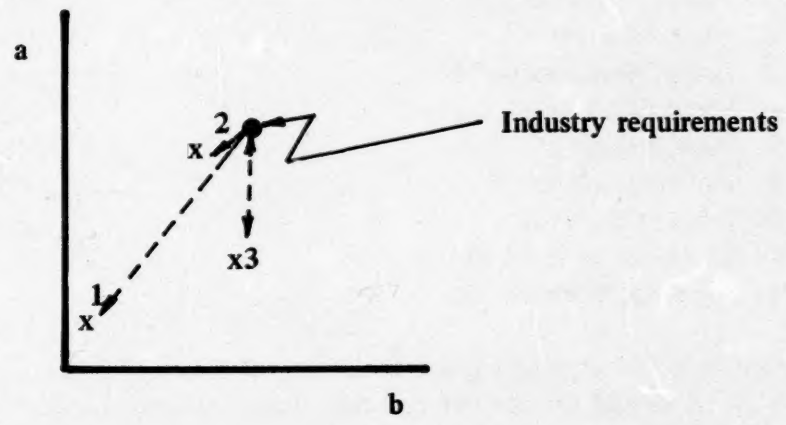

FIGURE 9. EXAMPLE COMPARISON OF INDUSTRY'S REQUIREMENTS WITH THEIR AVAILABILITY IN SUBREGION

The regional/industrial allocation model draws heavily on input-output data and illustrates the significance of input-output tables in identifying industry requirements, market, and supplier linkages. A wealth of information is developed on specific industries as well as on the subregions under consideration that can be utilized in other aspects of an industrial-development program.

RESULTS OF THE FEASIBILITY ANALYSIS

With the 100 desirable industries as input to the regional/industrial allocation model, the resources of the subregions and the requirements of these 100 industries were analyzed. Results of the analysis are presented in Tables 23 and 24. Table 23 shows the ranking of the best industries for the Four Corners Region according to the feasibility of an activity for a subregion. Therefore, the industries are listed according to the number of subregions where they were among the top 40 feasible industries. For example, metal office furniture was ranked high in all 21 subregions, while engine electrical equipment was among the top 40 industries in only one subregion. Therefore, which industries are most feasible for the Region as a whole can be ascertained from Table 23 simply by reading down the list of industries. Then, by looking for the highest score (1, 2, 3, or 4) in the row of scores for any particular industry, it is possible to see which subregion or subregions would best meet the requirements of the industry. For example I/O industry 40.08, architectural metal work, was ranked among the top ten industries in only one subregion – El Paso, Colorado. This would be the best choice for that industry. However, if, for some reason, the El Paso Subregion was not chosen, the next best subregions would be Denver, Colorado, Pueblo, Colorado, Alamosa, Colorado, Curry, New Mexico, and Utah, Utah. Architectural metal work was ranked between the eleventh and twentieth industries in these subregions.

Table 24 presents the final results of the feasibility analysis in a slightly different way. This table is based on scores which represent how close the subregions' resources and industries' requirements can be matched. The closer to zero this score is, the better the match. The score of seven was chosen as a cutoff point for feasibility. This means that the Denver, Colorado, Subregion would be a possible location for 88 out of the 100 desirable industries, whereas the Uintah, Utah, Subregion had only 5 industries with a score less than or equal to seven. Therefore, in Table 24, the subregions are presented according to the number of industries which are feasible for development. The order of the subregions is as follows:

1. Denver, Colorado (2)*
2. El Paso, Colorado (3)
3. Pueblo, Colorado (4)
4. Utah, Utah (4)
5. Curry, New Mexico (4)
6. Bernalillo, New Mexico (3)
7. Taos, New Mexico (2)
8. Mohave, Arizona (4)
9. Gila, Arizona (5)
10. Coconino, Arizona (3)
11. Alamosa, Colorado (5)
12. San Juan, New Mexico (1)
13. Grant, New Mexico (5)
14. Chaves, New Mexico (6)
15. Mesa, Colorado (7)
16. Sevier, Utah (5)
17. Iron, Utah (6)
18. La Plata, Colorado (6)
19. Graham, Arizona (6)
20. Grant, Utah (8)
21. Uintah, Utah (7)

As can be seen from this list, the subregions are essentially ranked from most urban to most rural. However, upon inspection of Table 24, it should be pointed out that there are several industries which have the greatest feasibility for development in the rural subregions.

*These are the states' subregion numbers and are keyed to the subregion map – Figure P-1.

TABLE 23. RANKING OF BEST INDUSTRIES FOR THE FOUR CORNERS REGION ACCORDING TO FEASIBILITY OF AN ACTIVITY FOR A SUBREGION

1: Industry is among the top ten most desirable for a subregion.
2: Industry is among the top twenty most desirable for a subregion.
3: Industry is among the top thirty most desirable for a subregion.
4: Industry is among the top forty most desirable for a subregion.

I/O Sector	SIC	Description	Subregions: Coconino, Ariz.	Mohave, Ariz.	Gila, Ariz.	Graham, Ariz.	Denver, Colo.	El Paso, Colo.	Pueblo, Colo.	Alamosa, Colo.	La Plata, Colo.	Mesa, Colo.	San Juan, N. M.	Taos, N. M.	Bernalillo, N. M.	Curry, N. M.	Grant, N. M.	Chaves, N. M.	Utah, Utah	Sevier, Utah	Iron, Utah	Uintah, Utah	Grand, Utah
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
23.02	2522	Metal office furniture	2	2	1	1	2	2	1	2	1	1	1	1	2	1	2	1	1	2	2	2	2
36.11	3272	Concrete products nec.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
47.04	3548	Metalworking machinery nec.	3	3	1	1	4	3	3	1	2	1	3	3	4	2	2	2	4	2	2	2	1
48.01	3551	Food products machinery	2	2	1	2	4	3	2	1	2	2	2	2	3	1	2	2	2	1	1	1	2
48.05	3555	Printing trades machinery	1	1	1	3	3	2	1	1	2	3	1	1	1	1	1	2	1	1	1	1	3
51.03	3576	Scales and balances	1	1	1	1	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
51.04	3579	Office machines nec.	1	1	1	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
53.01	3611	Electric measuring instruments	2	2	1	1	4	3	3	1	2	1	2	2	2	3	1	2	3	1	2	1	2
64.10	3988	Morticians goods	2	1	2	3	3	2	1	2	2	2	1	2	1	1	1	2	1	1	1	1	3
48.04	3554	Paper industries machinery	2	2	1	1	4	3	3	2	1	1	2	3	3	1	2	1	2	2	2	2	2
45.02	3532	Mining machinery	4	4	3	4	4	4	4	2	3	4	3			2	3	3	4	3	3	1	3
48.03	3553	Woodworking machinery	3	3	2	3			4	2	3	4	3	4	4	3	3	3	4	2	2	1	3
26.05	2751, 2752	Commercial printing	2	3	4	3	1		4	2	3	3	2	3		4	2	3		1	2	2	4
36.15	3281	Cut stone and stone products	1	1	1	3			3	2		3	3	1	1	2	1	1	2	3	2	2	2
51.02	3572	Typewriters	1	3	2	2			2	4	3	2	2	1	1		1	1	2	1	1	1	3
17.09	2298	Cordage and twine	2	2	2	3				3	3	3	2	2	3	4	2	3		1	1	2	4
40.05	3442	Metal doors, sash, and trim	3	2			1	1	2	3	4		4	3	2	2	3	4	3	3	3	3	
44.00	3522	Farm machinery		4	3	2	2	3	4	3	2		3		4	2	4	3	3			4	2
47.01	3541	Machine tools, metal cutting type	3	3	2	4	4	4	3	2			4	3	3	2	3	4	4	2	1	2	
62.04	3841	Surgical and medical instruments	2	2	3		2	1	3	4	4	4	4	2	2	3	3		2	3	3	3	
26.04	2741	Miscellaneous publishing	2	1			3	3	2	2	4		3	2	2	4	4	4		2	2	2	
27.02	2871, 2872	Fertilizers	4	3		2	3	4	2		2	1	1	2	2	4	3	1	2				2
36.03	3253	Ceramic wall and floor tile	1	1	2	3	1	1	1		4	2	1	1	1	3	1	1	1				
49.03	3564	Blowers and fans		4	2	2				3	1	2	3		4	2	4	2	4	3	3	2	1
55.01	3641	Electric lamps	3	3	2	1				2	1	1	3	4	4		2	1		2	3	4	1
62.05	3842	Surgical appliances and supplies	2	2	3	4					4	3	3	2	2	3	2	3	4	4	4	4	
23.04	2541	Wood partitions and fixtures	3	2	3		1	1	2	4			4	2	2	2	4		2		4	4	
23.05	2542	Metal partitions and fixtures	4	3	4		3	2	3	3				3	3	3	4		2	2	2	3	
36.05	3259	Structural clay products nec.	1	1	3		2	1	1				2	1	1	3	1	3	1	3	2		
45.01	3531	Construction machinery		4	3	1	2	2	3	1	1	2	4			2	4	2	3				1
47.02	3542	Machine tools, metal forming type	4		2	1		4	3	1	1	2	3			3	4	2		3	3		1
23.01	2521	Wood office furniture	4	2			2	2	3				4	3	4		4	4	2	3	4	4	
40.08	3446	Architectural metal work		3	4		2	1	2	2				4	3	2	4		2	3	3	3	
48.02	3552	Textile machinery	3	3	4			4	4				4	4	3	3	3		3	3	3	3	
49.07	3569	General industrial machinery nec.	4	4			2	1	1	1				3	3	1	4		2	2	1	3	
32.03	3264	Porcelain electrical supplies	3	4	3	2					2	3	2	4			3	2		4	4	2	3
36.09	3269	Pottery products nec.	3	4		3					2	3	2	4			3	3		4	4	3	3
36.10	3271	Concrete block and brick	1	1	4		1	1	1			4	2	1	1	2	2	3	1	4	3		
52.01	3581	Automatic merchandising machines		4	3		4	3	4	3				4		4		4	4	4		3	4
52.05	3589	Service industry machines nec.	4	4			3	3	3	4				4	3	4			3	3	3	3	
23.03	2531	Public building furniture			4	3	4	4	4	4	3	3		3				3	4				2
36.02	3251	Brick and structural clay tile	1			4	1	2	1			1	1	2	1		2	1	1				
20.02	2421	Sawmills and planing mills, general	4			2				4	1	2	3		3			4		4	4		1
51.01	3571	Computing and related machines	4		4	4	1		4														
23.07	2599	Furniture and fixtures nec.			3	2	3	4		3	3	2						4	3				1
46.02	3535	Conveyors and conveying equipment						4	4	4				4	4	3				4	4	4	

TABLE 23. (Continued)

I/O Sector	SIC	Description	Subregions																			
			Coconino, Ariz.	Mohave, Ariz.	Gila, Ariz.	Graham, Ariz.	Denver, Colo.	El Paso, Colo.	Pueblo, Colo.	Alamosa, Colo.	La Plata, Colo.	Mesa, Colo.	San Juan, N. M.	Taos, N. M.	Bernalillo, N. M.	Curry, N. M.	Grant, N. M.	Chaves, N. M.	Utah, Utah	Sevier, Utah	Iron, Utah	Uintah, Utah	Grand, Utah
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
40.07	3444	Sheet metal work					2	3	4	4						4			4	4	4		
59.02	3715	Truck trailers		4			2	1	2	3						4			3			4	
53.08	3629	Electrical industrial apparatus nec.			4	4				3										4	4	3	4
63.01	3831	Optical instruments and lens			2	4					4	4	4									4	4
20.06	2432	Veneer and plywood				2					2	3	4					4					1
36.07	3262, 3263	Food utensils, pottery	4			4							4	4			3	4					
46.03	3536	Hoists, cranes, and monorails				4		4		4	3	4											2
52.02	3582	Commercial laundry equipment					3	2							4	4				4	4		
27.01	281 (exc. 28195)	Industrial inorganic and organic chemicals				2	1				4							4					3
34.01	3131	Footwear cut stock								3	4	4										4	3
46.04	3537	Industrial trucks and trailers								4	4	4				4							3
48.06	3559	Special industry machinery nec.			4	4					4	4											4
55.02	3642	Lighting fixtures			4		4	4							4				4				
20.03	2426	Hardwood dimension and flooring				3					3	4											2
29.01	283	Drugs	3												4								
18.04	23 (exc. 239), 3992	Apparel made from purchased materials					1																
20.04	2429	Special product sawmills nec.																					4
23.06	2591	Venetian blinds and shades																					4
43.01	3511	Steam engines and turbines											4										
58.04	3694	Engine electrical equipment																					4

TABLE 24. RELATIONSHIP BETWEEN FEASIBLE INDUSTRIES AND SUBREGIONS*

I/O Sector	SIC	Description	Subregion: Denver, Colo.	El Paso, Colo.	Pueblo, Colo.	Utah, Utah	Curry, N. M.	Bernalillo, N. M.	Taos, N. M.	Mohave, Ariz.	Gila, Ariz.	Coconino, Ariz.	Alamosa, Colo.	San Juan, N. M.	Grant, N. M.	Chaves, N. M.	Mesa, Colo.	Sevier, Utah	Iron, Utah	La Plata, Colo.	Graham, Ariz.	Grant, Utah	Uintah, Utah
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
17.09	2298	Cordage and twine	6	6	5	5	4	3	2	2	2	2	3	2	2	3	3	1	1				
18.04	23 (exc. 239), 3992	Apparel made from purchased materials	1	8																			
19.03	2393-2399	Fabricated textile prods. nec.	9																				
20.02	2421	Sawmills and planing mills, general	7	7	6	7	6	3	5	6		4	4	3	5	4	2			1			
20.03	2426	Hardwood dimension and flooring	9	8	8	8	7										4						
20.06	2432	Veneer and plywood	8	7	6	7	7	6		6	6	6		4		4	3				2	1	
21.00	244	Wooden containers	8	7	7	8	7																
22.01	2511, 2519	Wood household furniture	8	8	8	8																	
22.03	2514	Metal household furniture	9	8																			
23.01	2521	Wood office furniture	2	2	3	2	5	4	3	2	5	4	5	4	4	4		3					
23.02	2522	Metal office furniture	2	2	1	1	1	2	1	2	1	2	2	1	2	1	1	2	2	1	1		
23.03	2531	Public building furniture	4	4	4	4	5	6	3	5	4	6	4	5		3	3						
23.04	2541	Wood partitions and fixtures	1	1	2	2	2	2	2	2	3	3	4	4	4								
23.05	2542	Metal partitions and fixtures	3	2	3	2	3	3	3	3	4	4	3	5	4			2	2				
23.06	2591	Venetian blinds and shades	9	8																			
23.07	2599	Furniture and fixtures, nec.	3	4	5	3	5	6	6	6	3		3			4	2						
25.00	265	Paperboard containers and boxes	5																				
26.03	273	Book printing and publishing	7	6	7	7																	
26.04	2741	Miscellaneous publishing	3	3	2	5	4	2	2	1	5	2	2	3	4	4		2	2				
26.05	2751, 2752	Commercial printing	1	5	4	5	4	5	3	3	4	2	2	2	2	3	3	1	2				
27.01	281 (exc. 28195)	Industrial inorganic and organic chemicals	1		7	7										4							
27.02	2871, 2872	Fertilizers	3	4	2	2	4	2	2	3	5	4		1	3	1	1			2			
27.04	2861, 289	Miscellaneous chemical products	7																				
28.01	2821	Plastic materials and resins	8																				
29.01	283	Drugs	6	6	6	6	7	4	5	6		3		5	5								
32.03	3031, 3069	Reclaimed rubber and misc. rubber products	8																				
34.01	3131	Footwear cut stock	6	5	6	6	5	6	5	6			3	5		5	4						
34.02	314	Footwear except rubber	1																				
36.02	3251	Brick and structural clay tile		2	1	1	6	1	2	5	6	1		1	2	1	1						
36.03	3253	Ceramic wall and floor tile	1	1	1	1	3	1	1	1	2	1		1	1	1	2						
36.05	3259	Structural clay products nec.	2	1	1	1	3	1	1	1	3	1		2	1	3		3	2				
36.07	3262, 3263	Food utensils, pottery	8	7	7	7	6	5	4	5	6	4		4	3	4							
36.08	3264	Porcelain electrical supplies	8	7	6	6	5	5	4	4	3	3	5	2	3	2	3	4	4	2			
36.09	3269	Pottery products nec.	7	7	6	6	5	5	4	4	5	3	5	2	3	3	3			2			
36.10	3271	Concrete block and brick	1	1	1	1	2	1	1	1	4	1		2	2	3	4	4	3				
36.11	3272	Concrete products nec.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
36.15	3281	Cut stone and stone products	5	3	2	3	1	2	1	1	1	1	5	1	1	2	3	2	2				
40.02	3432	Plumbing fittings and brass goods	6	5	6	6	6	6		6			6										
40.05	3442	Metal doors, sash, and trim	1	1	2	3	2	2	3	2	5	3	3	4	3	4		3	3				
40.07	3444	Sheet metal work	2	3	4	4	4	5	5	5	6	6	4										
40.08	3446	Architectural metal work	2	1	2	2	2	3	4	3	4	5	2	5	4	5		3	3				
41.02	3461	Metal stamping	9																				
42.05	3481	Misc. fabricated wire products	8	8																			
43.01	3511	Steam engines and turbines	4																				
43.02	3519	Internal combustion engines nec.	7	7	7	7	7																

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TABLE 24. (Continued)

I/O Sector	SIC	Description	Subregions: Denver, Colo.	El Paso, Colo.	Pueblo, Colo.	Utah, Utah	Curry, N. M.	Bernalillo, N. M.	Taos, N. M.	Mohave, Ariz.	Gila, Ariz.	Coconino, Ariz.	Alamosa, Colo.	San Juan, N. M.	Grant, N. M.	Chaves, N. M.	Mesa, Colo.	Sevier, Utah	Iron, Utah	La Plata, Colo.	Graham, Ariz.	Grant, Utah	Uintah, Utah
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
44.00	3522	Farm machinery	2	3	4	3	2	4	5	4	3	5	3	3	4	3	2			2			
45.01	3531	Construction machinery	2	2	3	3	2	5	6	4	3	5	1	4	4	2	2			1	1	1	
45.02	3532	Mining machinery	4	4	4	4	2	6	5	4	3	4	2	3	3	3	4	3	3				
46.02	3535	Conveyors and conveying equipment	5	4	4	5	3	4	4	5	5	5	4		5								
46.03	3536	Hoists, cranes, and monorails	5	4	5	6	6						4			5	4						
46.04	3537	Industrial trucks and tractors	5	5	5	5	4	6	6	6	5		4				4						
47.01	3541	Machine tools, metal cutting type	4	4	3	4	2	3	3	3	2	3	2	4	3	4		2	1				
47.02	3542	Machine tools, metal forming type	5	4	3	5	3	5	6	5	2	4	1	3	4	2	2	3	3	1	1	1	
47.04	3548	Metalworking machinery nec.	4	3	3	4	2	4	3	3	1	3	1	3	2	2	1	2	2	2	1	1	
48.01	3551	Food products machinery	4	3	2	2	1	3	2	2	1	2	1	2	2	2	2	1	1	2			
48.02	3552	Textile machinery	5	4	4	3	3	3	4	3	4	3	5	4	3	5		3	3				
48.03	3553	Woodworking machinery	5	5	4	4	3	4	4	3	2	3	2	3	3	3	4	2	2				
48.04	3554	Paper industries machinery	4	3	3	2	1	3	3	2	1	2	2	2	2	1	1	2	2	1	1		
48.05	3555	Printing trades machinery	3	2	1	1	1	1	1	1	1	1	1	1	1	2	3	1	1	2			1
48.06	3559	Special industry machinery nec.	6	5	6	5	5	6	6	6	4		5	5	5								
49.03	3564	Blowers and fans	5	5	5	4	2	4	5	4	2	5	3	3	4	2	2	3	3	1	2	1	
49.07	3569	General industrial machinery, nec.	2	1	1	2	1	3	3	4	5	4	1	5	4			2	1				
51.01	3571	Computing and related machines	1	5	4	3		2	3		4	4	5				3						
51.02	3572	Typewriters	5	5	2	2	6	1	1	3	2	1	1	2	1	1	2	1	1				
51.03	3576	Scales and balances	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
51.04	3579	Office machines, nec.	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
52.01	3581	Automatic merchendising machines	4	3	4	4	4	5	4	4	3	5	3	5	5	4							
52.02	3582	Commercial laundry equip.	3	2	5	5	4	4	6	5	5	6	5										
52.05	3589	Service industry machines nec.	3	3	3	3	4	3	4	4	5	4	4					3	3				
53.01	3611	Electric measuring instruments	4	3	3	3	3	2	2	2	1	2	1	2	1	2	1	1	2	2	1		1
53.08	3629	Electrical industrial apparatus nec.	6	5	6	6	5	6	6	5	4	5	3	5	5								
55.01	3641	Electric lamps	7	6	5	6	5	4	4	3	2	3	2	3	2	1	1	2	3	1	1	1	
55.02	3642	Lighting fixtures	4	4	5	4	5	4	5	5	4	5	5	5									
56.01	3651	Radio and TV receiving sets	8	8																			
57.03	3679	Electronic components nec.	7	7																			
58.04	3694	Engine electrical equip.	8	7	8	7	7																
58.05	3699	Electrical equipment nec.	9																				
59.01	3713	Truck and bus bodies	7	6	6	6	6	7		6													
59.02	3715	Truck trailers	2	1	2	3	4	5	6	4	6	5	3										
61.05	3751	Motor cycles, bicycles and parts	9	8	7	7	7																
61.07	3799	Transportation equipment	6	6	7	7	6																
62.01	3811	Engineering and scientific instr.	6	6	7	5	6	7	6		6												
62.02	3821	Mechanical measuring devices	7	7	7	7	6	7	6		6												
62.04	3841	Surgical and medical instruments	2	1	3	2	3	2	2	2	3	2	4	4	3	5	4	3	3				
62.05	3842	Surgical appliances and supplies	6	6	5	4	3	2	2	2	3	2		3	2	3	3						
63.01	3831	Optical instruments and lenses	6	6	5	5	7	5	5	5	2	5	5	4	5		4						
64.01	391, 3961	Jewelry, including costume and silverware	9																				
64.04	3949	Sporting and athletic goods nec.	7	6	7	6		6	5		6												
64.10	3988	Morticians goods	3	2	1	1	1	1	2	1	2	2	2	1	1	2	2	1	1				

*Values in cells reflect ranking of an activity according to its suitability: Example: 1 – top ten, 2 – top 20, etc.

Note: Industries which did not have a reasonable chance of locating in a subregion were not included in this table.

CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

In many ways, the Four Corners Region is one of the richest areas of the United States, reflecting a number of scenic, forest, mineral, industrial, and, especially, human resources. However, despite the presence of these natural advantages, the Region demonstrates a number of pervading economic and social liabilities which have caused it to fall behind many other areas of the country and the non-Regional portions of the four states in terms of growth in employment, income, and population. The strengths of the Region have been correctly identified by leaders in the study area and include human resources, labor availability, the physical setting (including image), natural resources, and locational advantage. Barriers to development related to labor, supporting services and amenities, markets, transport, and financing have also been fully recognized by persons in a position to actively assist in developing the Region. However, despite a recognition of what might and must be done in the Region to raise the quality of life characteristic of this area, few development programs are under way to assist in this growth. Many extremely talented developers in the four-state area devote their efforts almost entirely to the major metropolitan areas outside the Region, which at present are perhaps more "salable". This means, unfortunately, that the Region, which needs assistance most, is often neglected when it comes to actual development programs.

In the area of resources, the Region is in many ways well endowed. In terms of human resources, considerable potential for improvement exists which could cause the Region to develop into one of the most desirable areas in this regard. Relatively large numbers of potential workers could be attracted to a set of locations in the Region, and could serve as a labor force for most types of establishments. However, at present, the true potential of this work force cannot be realized because of a number of problems, most of which may be overcome. Poor work habits and low skill levels often make the supply of effective and productive labor in the Region inadequate. With training and transportation improvements, the Region could become the "human resources" center of the United States. Further, there are substantial numbers of persons in the Region with high skill levels in both industry and research, so this type of resource should not be approached solely from the labor point of view. There are, however, because of the sparse population in parts of the Region, a number of small communities where the availability of workers is limited.

In terms of agricultural and mineral resources, the Region is fairly well endowed. Agriculturally, cotton, livestock, sugar beets, citrus, and other products provide inputs to food processing and could provide inputs to a textile industry.

In terms of materials, the Region is especially well endowed, although the major payoffs related to those resources are usually lost. Copper, petroleum, iron and steel, and lead-zinc-silver all are produced, but are usually exported from the Region for final processing and manufacture. Consequently, the "value added" in processing these materials is lost to the study area. If more manufacturing activities utilizing these materials could be attracted to the study area, local income could be increased significantly. In terms of industrial resources, a somewhat contradictory situation exists. Because of the relatively low level of manufacturing in the study area, industrial linkages are not well developed; however, the industries which are present are extremely desirable from the point of view of spinning off other activities. For example, the electronics and machinery manufacturers provide a number of forward and backward linkages for attracting other firms.

These resources are perhaps made even more desirable by the fact that a number of comparative advantages accrue to the Region. These include: an attractive image, good labor relations, a number of building sites, improving transportation, and accessibility to selected markets. These resources are tempered by a number of barriers, including some labor-force problems, remoteness to some markets and supplies, and a lack of amenities. When balanced out, selected locations in the Region emerge as being especially attractive for many types of relatively footloose industries. Many more industries could be attracted to the Region than are presently found there, but this is unlikely to occur until some agency or group decides to "sell" the Region and make all of its benefits known.

RECOMMENDATIONS

If the Four Corners Region is to realize its full development potential, the following programs and actions appear necessary.

(1) An improvement program designed to elevate the living conditions associated with ethnic and minority groups.

While the "Angloization" of Indian and Mexican populations is unnecessary and is in many respects undesirable, it is clear that in many cases these groups are expected to work and behave as "middle class whites". Before these people are compared with other elements of the population in terms of work performance, they should, through health, educational, legal, and other services, be brought to a comparable level in other areas as well. In many cases, bad work habits reflect bad health.

(2) Specific educational and training programs will be needed to make Four Corners residents competitive in the job market.

If the population of the Region is to be transformed into "human resources", educational and vocational programs must be expanded. These programs should include special counseling programs to relate ethnic populations to the requirements of most manufacturers. This does not mean that the unique cultures and values of ethnic groups in the Region are to be sacrificed, but there are certain minimal standards of work performance and productivity that must be met if the Region is to be competitive. Also, while general vocational and technical programs are better than none, training efforts related to specific types of jobs which will be needed in the future is best. This report would provide guidance in this area.

(3) Transportation, of most types, is not adequate in the Region and must be improved.

At present, most forms of transport are barely adequate in the Region. In most of these cases, however, this reflects lack of demand, and improvements will be tied to development (which in turn is related to transport). A major problem, however, exists in the area of personal transport. Too many prospective workers are cut off from jobs by poor personal transport. This also has the effect of greatly reducing available employees at a given activity. It is recommended, therefore, that a program be developed to provide low-cost transit for workers in the Region.

Outside of major road, rail, and air routes which connect major cities, it is too difficult to carry commodities inside the Region. Also, much of the transport capacity of the Region is oriented to major east-west routes and straight-through hauls. An example of this latter factor are freight rates and rate break points which put the Region at a disadvantage in serving West Coast markets. In terms of its effective location, these freight rates tend to put the Region much further from these markets than is the case geographically.

(4) Financial and industrial development must be strengthened in the Region.

At present, the Region is often considered to be devoid of locational disadvantages, and this is not true. Further, while the point may not have been recognized in the past, the real strengths of the study area involve the total areas of these states. In the future, whether or not the Region portions of these states offer markets and supplies will increasingly influence the attractiveness of the major metropolitan areas. Consequently, there are many reasons why development should take place in the Region. At present, State Departments of Development, Utilities, Universities, and many local groups are technically qualified to undertake this task, although in some cases they are understaffed when it comes to selling their most desirable locations. Financial institutions and other business-supporting activities are also reticent about screening the Region, primarily because of bad experience in the past. It should be noted that in the conduct of this research, with its large numbers of interviews, a great majority of persons in development indicated that they wanted to do something in the Region, and would be willing to do so if some type of organized program could be initiated.

(5) Target industries should provide the basis for an industrial development program.

Industrial development efforts should be aimed at three types of industries. First, as noted earlier, many of the benefits which should accrue to the mineral industries in the Region are lost because the higher value-added stages in their processing are missing. If more manufacturing stages dealing with final or intermediate processing of these materials could be attracted, then the Region would benefit from this increased income.

Second, the machinery, instrument, electronics, and other manufacturers in the Region and on its periphery provide a number of links with desirable industries, in terms of skills, wages, and growth potentials. These are elevating activities which would do a lot for the Region's economic and human-resource development. When coupled with the research and development facilities present in the Region or the neighboring SMSA's, a positive program designed to foster the growth of high-skill and high-technology industry may have merit.

Third, because of the size of many communities in the Region, industrial-development programs should focus on specific activities best suited for these areas.

(6) Specific target cities or subregions may offer the best hope in getting growth started.

The fact must be faced that large parts of the Region offer little attraction for economic activities, and these include a number of very small towns. To initiate growth in the Region, it seems most desirable to identify specific target cities and towns for a first-phase development effort. This would capitalize on the attractiveness of these centers, and benefit the majority of the Region's population.